FLIGHT, SEPTEMBER 29, 1938 FIRST AERO WEEKLY IN THE WORLD

FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

1938
XXXIV

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Per Ardua ?

THE situation changes from moment to moment, and as we write we cannot tell whether when these words appear in print the country will be at peace or war. There is no militaristic spirit in the land; nobody wants to experience another war; but one thing is certain, namely, that Britain does not want peace with dishonour. Every possible effort has been made by this country, through its Prime Minister, to avert the horrors of war in Europe. If the event should prove that his efforts have been in vain, then Britons must face the outcome with the knowledge that their consciences are clear and that their quarrel is just.

When war broke out in 1914 there were many who welcomed it as a great and novel adventure. There had been no great war in Western Europe since 1871, and young men were keen for a new experience, anxious to prove their mettle against the fire of the enemy. Moreover, internal politics at that time had been very bitter, and it was a positive relief to forget domestic jangles and to unite against a common foreign foe.

Long before the bugles sounded the "cease fire" on November 11th, 1918, everybody knew that war was no joyous adventure but a grim tragedy. Now, even those who are too young to have fought in the last war have heard enough of its horrors to be free from any delusion about the subject. In the commonly accepted meaning of the term, there are now no Jingoes.

Jingoes All

YET at this serious moment we may find comfort in the words of the old popular song which gave rise to that term:—

"We don't want to fight, but, by Jingo, if we do,
We've got the ships, we've got the men, we've got the money, too."

Taken very literally, those doggerel lines express what every Briton is feeling now. In that sense we are all Jingoes.

The song placed the Fleet first. It is still first in the order of Britain's fighting forces. In itself it is fewer in numbers than it was in 1914, but its superiority over the German Navy is far greater now. It is inconceivable that the German Navy should risk another Jutland. It has numerous submarines, it is true, and they would do their best to make a nuisance of themselves; but they would not come as a surprise again. Our Navy has been studying submarines, and could deal with them. If it is war, then again German commerce will be swept off the surface of the seas and Germany will be blockaded. Hitler has said that his country is now self-contained, but that statement will only deceive his dupes. In iron ore and oil, for example, Germany is not self-supporting.

As for our Army, it is difficult at the moment to see what part it would play. From France there is no direct access to Bohemia, while the lines on each side of the Franco-German frontier are so strong, at least on the French side, that frontal attacks are not likely. The feverish digging in which the Germans have indulged during the last few weeks suggests that their high command was not entirely satisfied with the strength of the lines on the German side, and, of course, they cannot accomplish in a few weeks what the French have done at leisure in recent years. But it might turn out that on that front the fighting would be confined to an artillery duel.

A Chance for Air Power

THAT leaves the Air Forces in a position of very great importance. Only through the air could France and Britain carry help to Czecho-Slovakia. There seems little doubt that the first German effort would be an attempt to break through the mountain barrier round Bohemia. That Germany is strong

enough to overwhelm the smaller country most people will consider certain, even though the Czecho-Slovak army is well trained and very well equipped. Its weapons are of the best—has not our own War Office purchased the rights of the Bren machine-gun as being the best in the world? Even so, German numbers ought to tell.

It may be remarked that in the last war Germany overran Belgium, Serbia, Montenegro and Rumania, but for all that she did not win the war, and after the Armistice all those victims recovered their freedom. Germany would only be able to demolish Czecho-Slovakia if she defeated Britain and France. Of that conclusion we know, and Hitler must know, that there is not the slightest chance.

It seems, then, that the first duty of the French and British Air Forces would be to help the Czech Army to the utmost of their ability. It would be for them to bombard the German Army with all their might and main, using every endeavour to prevent reinforcements and munitions from reaching the German firing line.

What of the Mediterranean?

WE have left Italy out of the reckoning so far, because at the moment of writing there is still ground for hope that Italy would remain neutral. We are accustomed to bombast from Rome, and do not accept threats as the same thing as actions. It is common knowledge that the Italian people would much sooner remain friends with the British people, and the wish is reciprocated. But if folly prevails, war with Britain can only mean ruin for Italy. Her communications with Abyssinia would at once be cut, and her army of 200,000 men there would be deprived of supplies. Perhaps Mussolini thinks that the Italian Navy and Air Force could drive the British Navy out of the Mediterranean, but no naval authority will agree with him. Incidentally, the Italian forces in Spain would also be deprived of supplies and reinforcements, for Italian shipping would have to remain in harbour—probably in Alexandria harbour. For her own sake as well as for ours we must hope that Italy would remain neutral.

Efficient Speed

SOME twelve years ago *Flight* introduced to the English-speaking aeronautical world three "figures-of-merit," by means of which the performance of aircraft could be compared and their relative efficiencies compared. The three figures were called the "High-speed figure," the "Distance figure," and the "Altitude figure." Between them they told fairly clearly the story of the relative efficiencies of different aeroplanes.

Three years later Professor B. Melvill Jones, of Cambridge, suggested another method in which he used the skin-friction drag as a basis for comparison. The "ideally streamlined" aeroplane of Professor Melvill Jones served to give aircraft designers quite a shock by showing how very far short of the theoretically attainable ideal their products fell.

The conception of "wetted surface" has now come to be generally accepted, but the method has not found its way into aircraft descriptions and performance figures to the extent it deserves, chiefly because the work involved has been fairly considerable. In *The Aircraft Engineer* section of *Flight* this week Mr. R. M. Clarkson describes a fairly simple way of calculating the speed efficiency of an aeroplane to obtain the ratio of the drag of the actual machine to that of Professor Melvill Jones' "ideal" aeroplane.

That Mr. Clarkson finds that the De Havilland Albatross is the most efficient aeroplane for which the figure has been published so far will not, we hope, deter manufacturers from quoting in future the streamline figure-of-merit of their products.

The Northern Route

SEVERAL months ago *Flight* called attention to the unfairness of the Cadman Report in omitting all reference to Allied Airways in connection with the planning and operation of European air routes. In June Sir Kingsley Wood made in Parliament a statement which was generally taken to mean that he was prepared to regard the Newcastle-Stavanger air route as a special case, and it was felt that the good work done by Allied Airways was not to be wasted.

That was four months ago. The Norwegian Government is now pressing the company for details of next year's plans, time-tables and so forth. But the continued silence of the British Air Ministry makes it impossible for Mr. Gandar Dower to make his plans. He does not know whether or not his case is to be considered, nor the extent, if any, to which he can count upon Government support.

When we first took up the subject of the Newcastle-Norway route we pointed out that, apart from the fairness or otherwise of the whole position, the time might come when the southern route to Scandinavia might become unworkable. As the outlook is to-day there seems to be a very good chance that such a contingency may arise in the very near future. Should that happen, the Northern route will assume strategic importance. For that reason alone the Air Ministry should make up its mind without further delay.

Advanced Training

IN spite of the activity in the matter of aircraft production in this country, the Reserve Schools are still short of advanced training equipment. Admittedly, most of them have a useful supply of Tiger Moths and Magisters for initial training, but there are very few Harts and Audaxes, for instance, to represent the true military type.

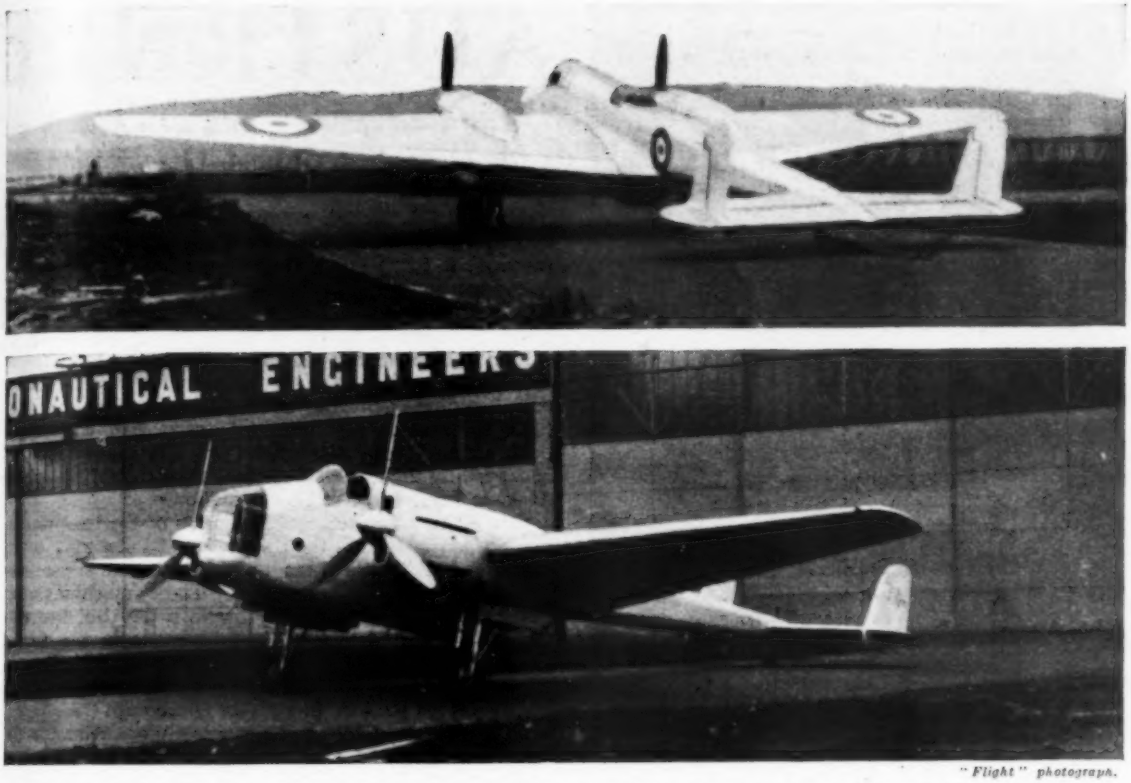
If any one of these pseudo-military types happens to be wholly or partially written off, it is usually a long time before a replacement can be made or a repair perfected, and in the meantime the hours put in by the remaining machines are so much increased that the time for inspection arrives almost every other week-end—just the period when every machine is needed.

Temporary Measures

THERE is little doubt that the Reserve Schools will eventually receive examples of more modern types, and already the old technique of forced-landing instruction is being modified by some instructors in favour of methods more suitable for use with high-efficiency types. Until the new equipment comes along it is obviously inevitable that there should be a shortage of pilots who are ready to fly Service machines.

It seems that a few dozen more Harts, or, better still, Demons, for instance, distributed among the Reserves schools would, in this work, be worth at least £200 apiece, which is the price being paid (according to general reports) by the South African Air Force for some of our obsolete machines. The use of Demons

DIARY OF FORTHCOMING EVENTS—PAGE 288



"Flight" photograph.

DAGGER-POWERED : The prototype of the Hereford bomber (two Napier Dagger VIII), now in production in the Short and Harland factory at Belfast, made an appearance last week-end. The machine shown actually started life as a Hampden with Bristol Pegasus engines and was built in the Handley Page works. Production machines are likely to have a modified nose.

would at least give the pupils some training in the operation of supercharged engines—and at present there are no blown engines being used at the Reserve Schools.

Supposing that, as may only be expected, more representative machines will eventually be issued to the Schools, would it not be advantageous at the present time to add dummy controls and indicators to the existing types so that the pupils may practise the sequence of operations in raising and lowering undercarriages and flaps, altering airscrew pitch and regulating boost?

In due course, too, it will be necessary for Reserve pupils to be given a chance to become accustomed to multi-engined types. With the momentous shortage of modern types, a start might be made with some civil twins. Probably some of these are, in any case, available, and if not, the cost of producing them would be little in comparison with that of producing suitable "stop-gaps." Such machines, when the Reserve Schools have done with them, would at least be of value in the civil world.

After some three hundred or four hundred hours with Hart types, and a few more hours on civil twins, the pupil should be ready, when necessary, to fly practically anything. But the ability to do the right thing instinctively in an emergency can only be obtained through familiarity with the particular type in question and the sooner the Reserve pupils can have the use of a few Battles or Blenheims the better.

If three representative modern Service types could now be supplied for use by the Schools in rotation, the loss would be unnoticed in the regular strength, while the experience gained by the more advanced Reservists would be extremely valuable.

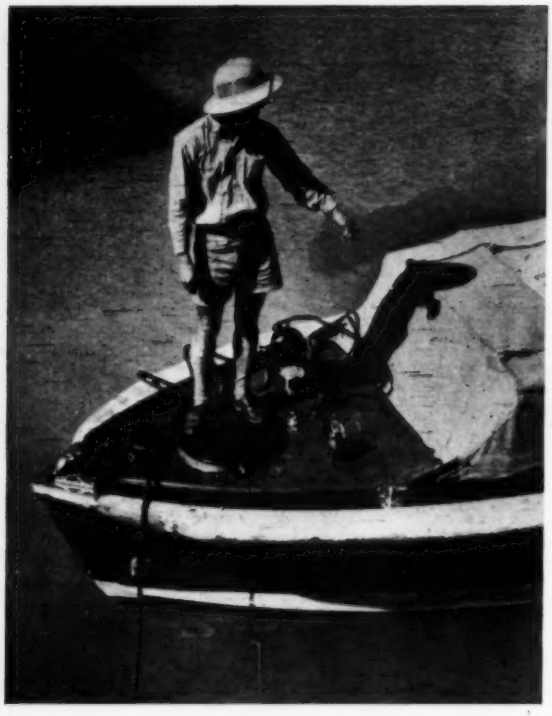
Complaints

IN the course of conversation one hears a number of moans from Reserve pupils. Many of these are doubtless unjustified, but one or two appear to require an airing.

There is, for instance, the case of the "old-timer" Reservists, many of whom have an experience far beyond anything to which a normal annual course at a Reserve Centre can add. Some of them are transport pilots with a considerable experience of modern types, and yet they can sometimes do little better than fly from here to there in any available primary trainer or similar type.

Surely the experience, at least, of these transport pilots can be utilised with good effect during their Reserve training? It might not be too much to suggest that they could go, more or less in a civilian instructor's capacity, to some of the squadrons where the latest types are just going into service. Their experience in the use of radio and, more particularly, in the use of blind-approach equipment, might be of inestimable value. Whatever happens, it is a pity to waste their experience in the way in which it is so often wasted.

Another little point is that the Link ground trainers, with which quite a few Reserve Schools are now equipped, do not appear to be in proper use. In one or two cases, at least, these trainers have been installed for months, and yet not more than one or two pupils have ever seen them. Probably the instructors have not had a chance to learn their whys and wherefores, but if this is the case then it is surely time for them to learn.



The Coxswain on the bows of the control launch at Karumba, the new Qantas base now under construction.

AUSTRALIA

Distributing the Mail : Flying Impressions : Ground Organisation

THE distribution of the all-up mail from Darwin, whither it is carried by the Empire flying boats, has for some time been one of the most prominent considerations in the development of Australian commercial aviation. As explained to the writer at the headquarters of the Civil Aviation Board, in Melbourne, by Captain S. H. Crawford, Secretary to the Board, the current scheme is somewhat temporary in that there are no long-term contracts but revision will be undertaken in the near future.

For the time being the mail diverges into three streams. One is carried through on the Qantas flying boats to Brisbane and Sydney; the second, in the hands of Guinea Airways, is taken down the centre of the Continent to Adelaide; and the third portion, allotted to the MacRobertson-Miller Aviation Co., Ltd., goes down the west coast to Perth.

Although Sydney and Adelaide get their three deliveries a week by the services mentioned, Perth has only two direct deliveries under the current scheme, the third consignment of mail, for reasons of economy, being taken "down the centre" to Whyalla whence it is carried by the east-west service of Australian National Airways Pty., Ltd., to its destination.

One of the more regrettable aspects of the temporary distribution scheme is the compulsory "loitering" over the Darwin-Adelaide route by the fast and expensive Lockheeds of Guinea Airways. These machines are quite capable of making the trip in a day but are restrained so that deliveries shall be made in the three capitals at approximately the same time. It has been suggested that the mails should be flown at the highest possible speed but held in the Post Office until the official hour of release. This would enable Guinea Airways to make the fullest use of their fine equipment.

There is no additional charge for delivery of the all-up mail by the three distributory services, a fact which must be causing some concern among the Dutch whose superior speed over the route to Sydney benefits appreciably only residents of Brisbane, Sydney and Melbourne.

Although the incoming mail is delivered for 1½d. the charge for letters in the other direction is 5d. per ½ ounce. Until recently the charge was 1s. 6d. Australia's standard internal charge is 2d.

According to our Australian contemporary *Aircraft*, the outward surcharge of 3d. is designed to recoup for the Government its minimum outlay of £102,000 for the Qantas service (£40,000 subsidy, £32,000 mail payment and £30,000 for the upkeep of bases, etc.) plus a further sum—probably at least £100,000—for new internal subsidies.

A section of the Karumba base as seen from the water tower, showing a part of the camp, the control building under construction and a stretch of river where the Empire boats alight.

During the stay in Australia of *Flight's* representative Mr. Thorby, Minister for Defence, made a statement on the defence value of the internal subsidised services, referring particularly to those between Darwin and Perth and between Darwin and Adelaide. He explained that the Government had had to retain the Air Mail surcharge partially to set off the cost of the subsidies and heavy expenditure on installing ground facilities. Referring to a suggestion that the cost of the Darwin-Perth and

AIRLINES

By H. F. KING

THIS article completes a survey of Australian military and commercial aviation by a member of the staff of "Flight" who travelled out by Imperial Airways Empire flying boat to make a first-hand study. The previous articles in the series appeared as follows:—

September 8: The Journey: England-India.

September 15: The Journey: Australia and Home Again.

September 22: The Royal Australian Air Force.

A Lockheed Electra 10A of Guinea Airways in the vicinity of Flemington Racecourse.

"Shell Aviation News" photograph.

Darwin-Adelaide services could be better applied to an inter-capital night-flying scheme for air mail distribution he said that aspects of defence and development should be kept in view, for the facilities would provide the foundation for an effective defence organisation round the Australian coast and up from Adelaide to Darwin. He stressed the importance of the meteorological facilities.

The present magnitude of Australian internal air services can be envisaged from a study of the accompanying tables which embody the latest data issued by the Civil Aviation Board. The first sets out the subsidised services and the second those services which are subsidised on a poundage basis by the Postmaster General's department and those which operate to a set schedule but which do not carry mail.

An important new service not included in these tables is that run by W. R. Carpenter Airlines from Sydney to Rabaul, New Guinea, by way of Brisbane, Townsville, Port Moresby and Salamaua. The distance is about 2,522 miles.

"Shell Aviation News" photograph.

A Stinson Model A trimotor of Airlines of Australia refuelling at Archerfield Aerodrome, Brisbane, after a night flight.

Table I.

AIR TRANSPORT IN AUSTRALIA AS AT AUGUST 8, 1938.

Regular Subsidised Services Carrying Passengers, Mail and Freight.

Service.	Route Mileage	Frequency.	Operating Company.	Miles flown per week.	Miles flown per year.	Type of aircraft used.	Passgr. Accom.
Sydney-Darwin-Singapore .. .	4,669	Thrice W.E.D	Qantas Empire Airways ...	28,014	1,456,728	Short Empire Boat (4 Pegasus XC).	21
Perth-Darwin	2,318	Twice W.E.D.	MacRobertson-Miller Aviation.	9,264	481,728	DH.86 (4 Gipsy Six)	10
Adelaide-Darwin	1,700	Thrice W.E.D.	Guinea Airways Ltd. ...	10,200	530,400	Lockheed Vega (P. & W. Wasp C.)	4
						Lockheed Electra 10A (2 P. & W. Wasp Junior SB).	10
						Lockheed 14H (2 P. & W. Hornet).	12
Perth-Adelaide	1,453	Thrice W.E.D.	Australian National Airways	8,718	453,336	Douglas DC.2 (2 Wright Cyclone).	15
Adelaide-Melbourne	410	D.E.D. (a)	" " " ..	4,920	255,840	" " " ...	15
Brisbane-Cloncurry	997	Twice W.E.D.	Qantas Empire Airways..	3,988	207,376	DH.86 (4 Gipsy Six)... ...	10
Cloncurry-Mt. Isa	63	Twice W.E.D.	" " " ...	252	13,104	DH.90 (2 Gipsy Major) ...	4
Mt. Isa-Daly Waters	566	W.E.D.	" " " ...	1,136	59,072	DH.90 (2 Gipsy Major) ...	4
Daly Waters-Wyndham (b)	529	W.E.D.	MacRobertson-Miller Aviation.	1,058	55,016	DH.84 (2 Gipsy Major) ...	6
						D.H83 (Gipsy Major) ...	3
Cloncurry-Normanton (b)	216	W.E.D.	Qantas Empire Airways ...	432	22,464	DH.83 (Gipsy Major) ...	3
						DH.50 (Siddeley Puma) ..	4
Sydney-Charleville	726	Twice W.E.D.	Butler Air Transport ..	2,904	151,008	DH.84 (2 Gipsy Major) ..	6
Sydney-Rabaul	2,522	W.E.D.	W. R. Carpenter	5,044	262,288	DH.86B (4 Gipsy Six) ...	10
Melbourne-Launceston-Hobart ...	408	D.E.D.	Australian National Airways.	4,896	254,592	Douglas DC.3 (2 Wright Cyclone).	21
Melbourne-King Is.-Launceston	296	Thrice W.E.D.	" " " ...	2,373	123,552	DH.89 (2 Gipsy Six)... ..	6-8
						DH.86 (4 Gipsy Six)... ..	12
Launceston-Flinders Is	100	D.E.D.	" " " ...	1,303	68,016	DH.89 (2 Gipsy Six)... ..	6-8
						DH.84 (2 Gipsy Major) ..	6
Brisbane-Cracow	290	W.E.D.	Aircrafts Pty.	580	30,160	DH.84 (2 Gipsy Major) ...	6
Rockhampton-Mt. Coolon	330	W.E.D.	P. H. Moody Air Taxis ..	660	34,320	Monospar ST.12 (2 Gipsy Major).	3
Sydney-Bega	205	Twice W.E.D. (c)	Adastra Airways	820	42,640	DH.83 (Gipsy Major) ..	3
						Waco (Jacobs L.4)	4
Adelaide-Whyalla	150	Thrice W.E.D. (d)	MacRobertson-Miller ...	900	46,800	DH.83 (Gipsy-Major) ...	3
						Fokker Universal (P. & W. Wasp.).	4
Perth-Wiluna-Kalgoorlie	813	W.E.D.	Airlines (W.A.) Ltd. ..	1,626	84 552	Stinson Reliant SR.7B (Lycoming).	3
						Spartan 3-seater (Gipsy II) ..	2
Normanton-Burketown	100	W.E.D.	North Queensland Airways	200	10,400	DH.84 (2 Gipsy Major) ...	8
	18,970			89,296	4,643,392		

W.E.D. = Weekly in each direction. D.E.D. = Daily in each direction (Sun. exc.).

(a) The contractor operates the Adelaide-Melbourne service six times weekly in each direction but is subsidised from the Civil Aviation Vote for three return trips weekly. Mails are carried on all trips.

(b) Aircraft specially fitted as ambulance carrier.

(c) The contractor operates the Sydney-Bega service six times weekly in each direction, but is subsidised for, and carries mails on, only two return trips weekly. Additional trips are shown in next table.

(d) The contractor operates the Adelaide-Whyalla service thrice weekly in each direction, but is subsidised for only one return trip weekly. Mails are carried on all trips.

So far as new overseas services are concerned interest is now centring on the extension of the flying boat service across the Tasman Sea to New Zealand. It is intended that in the beginning the Tasman crossing shall be made twice weekly each way with a possible extension to a thrice weekly service. New Zealand will hold 39 per cent. of the capital in the operating company, other proportions being held in the ratio of 38 per cent. by the United Kingdom and 23 per cent. by the Commonwealth of Australia.

It was not possible, during the writer's short stay, to obtain personal impressions of the great majority of the services, but one did fly with Airlines of Australia between Sydney and Melbourne, making the return trip by Ansett Airways. One recalls waiting in the hangar at Mascot Aerodrome (six miles south-west of the city), because the Brisbane connection had been delayed, and watching the Lockheed 14 of K.N.I.L.M. come in from the north. On the tarmac were a Douglas D.C.2 and D.C.3; it was to the former that we were eventually ushered.

Everything as far as the passenger is concerned is done American fashion. Miss Allen, the stewardess, buckles all the lap straps and is adamant with dissenters. We have bumps and barley sugar as we climb over the thickly wooded hills with the watery sun throwing our wing rivets into sharp relief. There is snow on the distant Blue Mountains. Out of sight on the left are coal and silver mines, ironworks and farms. A sister Douglas passes on her swift passage to Sydney. Machines going north fly at even heights, and those going south on odd figures.

A D.H.86 of Qantas. This type has done a vast amount of good pioneering work in Australia.

"Flight" photograph.

Clouds obscure Lake George, and Canberra passes a few miles to port. Capt. Taylor comes aft, and points out Tumbarumba (happy name!), and Miss Allen brings round tea. We talk airlines, and learn of A. of A.'s rapid growth since the days when the fleet consisted of a Desoutter and a Fox Moth. Now, in the fleets of Airlines of Australia and Australia National Airways (which company holds the controlling interests in A. of A.) there are two DC.3s (and two more expected this month), four DC.2s, two DH.86s, four or five Rapides and a variety of "hacks." The DC.2s have Cyclone F52 engines, and the DC.3s are powered with G-2 Cyclones driving Hamilton constant-speed airscrews. All the Douglases except one have Sperry automatic pilots. They bear Tasmanian aboriginal names.

Away on the left is Mount Kosciusco, Australia's 7,250ft. winter sports resort. We have a 55 m.p.h. head wind, and it is quite dark as we approach Essendon, Melbourne's aerodrome, through the smoky storm clouds. The stewardess tells us that this aerodrome will soon boast of the largest and most complete hangar in the Southern Hemisphere. The bus swishes us over the wet Melbourne streets, and we are soon snug in Petty's Hotel.

One was fortunate, for the return trip, in meeting both Mr. R. M. Ansett, managing director of Ansett Airways, Ltd., and Mr. J. J. Davies, his chief ground engineer.

Mr. Davies is tremendously enthusiastic about Ansett's three Lockheed Electras, which differ from the majority of their breed in that they are powered with Wright Whirlwind R.975-E.3 engines, which have a take-off rating of 450 h.p. on fuel of 80 octane number. These engines drive constant-speed Hamiltons, which score over the two-position type, in which the low-pitch setting is selected for climb, in that they can develop their full 450 h.p. for take-off. Mr. Davies also showed me a Lockheed 12 which is maintained by his company on behalf of Associated Airlines. I also saw an Airspeed Envoy used with great success by Ansett Airways. This machine was originally the personal property of Lord Nuffield, and is fitted with Wolseley Aries engines, the pistons for which were made locally by Polsen Motor Parts. Also on charge is a Fokker Universal with Wasp engine. This is the machine flown in Kenya by Lord Carberry, and subsequently by Tom Campbell Black and W. L. Hope.

A hangar companion is the Shell Company's Vega Gull with Series II Gipsy Six.

Ansett have up-to-date engine-testing equipment and the shops are a model of orderliness.

Of the trip back to Sydney one has some happy recollections: the quick take-off; the pilots' heads framed reassuringly in the bulkhead window; the plentiful barley sugar; the half-way stop in the pleasant afternoon sunshine at Narrandera, where we had a cup of tea in a little wooden hut—the sole airport building; the sun going down and seemingly inundating the plain with gold dust; the red glow of the sunset seeming to

TABLE II.

AIR TRANSPORT SERVICES IN AUSTRALIA AS AT AUGUST 8, 1938.

Regular Services (Unsubsidised) Carrying Passengers, Mails and Freight.

Service.	Route Mileage.	Frequency.	Operating Company.	Miles flown per per week.	Miles flown per year.	Type of aircraft used.	Passgr. Accom
Cairns-Normanton	350	W.E.D.	Nth. Queensland Airways	700	36,400	DH.80A (Gipsy III)	2
*Cairns-Portland Roads	380	Fortnightly (ea. dir.).	" " " ...	380	19,760	DH.84 (2 Gipsy Major) ...	6–8
Normanton-Koolatah-Normanton ...	370	Round trip fortnightly.	" " " ...	185	9,620	—— ...	—
Cairns-Townsville	174	8 times W.E.D.	" " " ...	2,784	144,768	DH.89 (2 Gipsy Six) ...	6–8
Cairns-Cooktown	106	4 times W.E.D.	" " " ...	848	44,096	—— ...	—
Brisbane-Cairns	899	Thrice W.E.D.	" " " ...	5,394	280,488	—— ...	—
*Townsville-Mt. Isa	537	W.E.D.	" " " ...	1,074	55,848	—— ...	—
*Brisbane-Rockhampton-Cracow-Monto-Brisbane.	786	—	Aircrafts Pty.	—	—	DH.84 (2 Gipsy Major) ...	6–8
*Brisbane-Rockhampton-Monto-Brisbane.	719	Round trip once weekly.	"	719	37,388	" " " ...	6–8
*Brisbane-Kingaroy	90	D.E.D.	"	1,080	56,160	" " " ...	6–8
Brisbane-Townsville	725	7 times W.E.D.	Airlines of Australia ...	10,150	527,800	Stinson Model A (3 Lycoming)	8
Townsville-Cairns	174	Twice D.E.D. but once Sun.	" " ...	4,524	235,248	Douglas DC.3 (2 Wright Cyclone).	21
						DH.84 (2 Gipsy Major) ...	6–8
						Monospar ST.12 (2 Gipsy Major).	3
Sydney-Brisbane	475	Twice D.E.D. but once Sun.	" " ...	12,350	642,200	Douglas DC.3 (2 Wright Cyclone).	21
						DH.84 (C2 Gipsy Major) ...	6–8
Melbourne-Wagga-Canberra-Sydney ...	478	D.E.D.	Australian National Airways.	5,736	298,272	DH.86 (4 Gipsy Six)... ...	12
						DH.89 (2 Gipsy Six) ...	6–8
Melbourne-Mildura	296	D.E.D.	" " " ...	3,552	184,704	DH.89 (2 Gipsy Six)... ...	6–8
Melbourne-Adelaide (via Mt. Gambier and Naracoorte).	473	D.E.D.	" " " ...	5,676	295,152	DH.89 (2 Gipsy Six)... ...	6–8
Melbourne-Sydney	455	Twice D.E.D.	" " " ...	10,920	567,840	Douglas DC.2 (2 Wright Cyclone).	15
Melbourne-Sydney (via Marrandera) ...	500	D.E.D.	Ansett Airways	6,000	312,000	Lockheed Electra 10B (2 Wright Whirlwind).	10
*Melbourne-Sydney (direct)	455	Sundays	"	910	47,320	" " " ...	10
Melbourne-Broken Hill (via Maldura) ...	460	D.E.D.	"	5,520	287,040	" " " ...	10
Melbourne-Hamilton	160	Twice D.E.D.	"	3,840	199,680	Airspeed Envoy (2 Aries III)	8
Melbourne-Hay	233	D.E.D.	Victorian and Interstate Airways.	2,796	145,392	Miles Merlin (Gipsy Six) ...	4
*Sydney-Bega (a)	205	4 times W.E.D. (b)	Adastra Airways	1,640	85,280	DH.83 (Gipsy Major) ...	3
						Waco (Jacobs L.4)	4
Sydney-Meree	330	Thrice W.E.D.	North Western Airlines ...	1,980	102,960	DH.90 (2 Gipsy Major) ...	5
Adelaide-Broken Hill-Mildura-Adelaide...	638	Round trip weekly (Suns).	Australian National Airways.	638	33,176	DH.89 (2 Gipsy Six)... ...	6–8
Adelaide-Renmark-Broken Hill	287	D.E.D.	" " " ...	3,444	179,088	" " " ...	6–8
Adelaide-Cowell-Port Lincoln-Adelaide...	372	Round trip 3 times weekly	" " ...	1,116	58,032	" " " ...	6–8
Adelaide-Kangaroo Island	95	D.E.D.	" " " ...	1,140	59,280	DH.84 (2 Gipsy Major) ...	6–8
Adelaide-Narrandera (via Mildura) ...	460	D.E.D.	Ansett Airways	5,520	287,040	Lockheed Electra 10B (2 Wright Whirlwind).	10
Whyalla-Iron Knob	35	W.E.D.	MacRobertson-Miller ...	70	3,640	Fokker Universal (P. & W. Wasp).	4
Total	10,908			100,686	5,235,672		

W.E.D. = Weekly in each direction. D.E.D. = Daily in each direction (Sun. exc.).
(a) See first table. In addition company operates service twice weekly in each direction, with aid of Governmental subsidy.
* Mails not carried.

Ansett Airway's Airspeed Envoy (Wolseley Aries) over Melbourne, with the Shrine of Remembrance (which is quite near the Air Board H.Q.) in the background, and Government House to the left. This machine was originally owned by Lord Nuffield and was flown by Sqn. Ldr. Hilton from Capetown to Croydon in fast time.

lessen even as one looked; the approach to Sydney in the dark; and skimming low over what appeared to be a great field of fairy lights.

One has pleasant memories of Australia's airlines.

The ground organisation, particularly the wireless facilities, is for the time being in a transitory state, and the present position was outlined to the writer at the Civil Aviation Board's headquarters by Mr. A. R. McComb, controller of ground organisation, Squadron Leader C. S. Wiggins, superintendent of radio, and Capt. S. H. Crawford, secretary to the Board.

Interesting Radio Equipment

The Air Board is making great efforts to bring ground organisation up to the pitch demanded by the highly developed air services. Probably the finest instance of the far-sighted policy adopted was the scrapping of the plans for medium-range radio beams on the American plan and the ordering of a number of ultra-short wave beacons.

The story behind this is not without interest. Sqn. Ldr. Wiggins went for a world tour with Mr. R. M. Badenach, an engineer of the P.M.G.'s department to study radio as applied to civil aviation. Discussing the Lorenz blind-flying equipment in Germany he hit on the idea of developing this equipment as a long-distance navigational beacon, and the Lorenz concern produced a set for trial. The Civil Aviation Board witnessed convincing demonstrations of the efficiency obtainable and placed a large order. Beacons of this type are being installed at Brisbane, Kempsey, Sydney, Canberra, Holbrook, Essendon, Nhill, Adelaide, Launceston and Hobart. Installations have been completed at Sydney, Brisbane and Launceston. It is hoped that the whole system will be in working order by the end of this year. Tests have indicated that the apparatus has complete freedom from atmospheric interference, even when the aircraft is flying in a thunderstorm, and that there is no failing or evidence of night effect up to 100 miles. It is reported that at no time has there been any evidence of multiple courses, splitting of the beam or shifting of the courses from correct alignment.

There are two main disadvantages: first, that the distance at which the signals can be received is a function of height, and secondly, that only two courses can be obtained. The second defect may be overcome. It is proposed to use similar equipment with an appropriate aerial system, for blind landing.

The second feature of the current programme is the installation of high-frequency direction-finding equipment which will overcome to a great extent atmospheric interference. Incidentally, Northern and Central Australia form the third greatest region in the world for interference of this nature; it is sometimes impossible to work on medium frequencies.

Where the Stations Are

The following is a list of the radio communication stations, asterisks indicating those selected for high-frequency D/F installations: Perth*, Kalgoorlie*, Forrest*, Ceduna*, Adelaide*, Nhill, Melbourne, Launceston, Hobart, Holbrook, Canberra, Sydney*, Kempsey, Brisbane*, Rockhampton*, Townsville*, Cooktown*, Port Moresby*, Salamaua*, Rabaul*, Cloncurry*, Karumba*, Groote Eylandt*, and Darwin*.

To meet the position temporarily the following system has been established; places marked with an asterisk having medium-wave D/F equipment: Perth*, Forrest*, Adelaide*, Melbourne*, Launceston*, Albury (Holbrook)*, Canberra*, Sydney*, Brisbane*, Rockhampton*, Townsville*, Cloncurry*, Karumba, Groote Eylandt, Darwin*, Geraldtown, Broome*, Wyndham, Oodanadatta*, Alice Springs, Daly Waters, Cooktown, Port Moresby, Salamaua and Rabaul.

In addition to these facilities a fine night-flying system with beacons is being built up along the main routes, and meteorological facilities are being further improved and extended.

PRIVATE FLYING

Topics of the Day

"*Flight*" photograph.

Forgotten

AT the risk of becoming tedious—though three weeks have elapsed since the fateful letters "C.A.G." appeared on this page—I still think that the most useful section of the amateur flying community is being unjustly ignored. When the C.A.G. scheme gets into its stride the novice enthusiast will, to a limited extent, be catered for, and the real Reserve is taking charge of the essentially fit, suitable, and willing young men of military age.

Surely some real use can be made of the quite large number of amateurs, whether actual owners or otherwise, who are far above the C.A.G. standard of efficiency, yet who are either not up to the really strict Reserve medical demands or who do not wish to hand themselves over body and soul, so to speak, to the Air Ministry—not this very minute, anyway.

Possibly the Government considers that this section can in due course be used satisfactorily for certain work without a great deal of additional training, but it might eventually be more economical to give them some of the necessarily specialised experience now. I do not know how many "A" licensed pilots there are with, say, more than 100 hours in their logbooks, but there must be quite a few, and it seems to me that this few is of more real value now than the many who may, in the next twelve months, have done a matter of twenty hours' flying or less.

It is difficult to think of any way in which experienced "A" licensed pilots can be brought into the existing picture, but no scheme which can be suggested could be much more useless, on the face of it, than the C.A.G. business in its basic essentials and without considering the probability that a great number of the pupils will be doing very much more than the originally stipulated (and ridiculously low) minimum number of hours.

Why Not?

MY suggestion, for what it is worth, is that just as soon as the present Reserve Schools are being issued with more modern equipment and can afford to let some of their present machines go, each club might be offered one or two Hart Trainers or similar machines for work by advanced members. It is not suggested that these members should be taught to use the machines as weapons of war or even for formation work, but that these larger machines would simply be flown about with civil registrations and treated merely as usefully additional items in the club fleets.

The majority of Reserve pupils appear to be sent off on Harts without much difficulty after a good deal less than 100 hours' flying on primary training types, and there is, in fact, nothing either difficult or dangerous about these more advanced machines. The pupil merely has to get used to the greater number of instruments and devices to which, in any case, he will be expected to attend if, as certainly seems possible, he is called upon to fly military types in time of war.

At the moment it seems improbable that any of the Reserve Schools could spare any of their Harts—there are few enough of them as it is—but I am banking somewhat on the undoubted probability that these Schools will, when the aircraft production programme gets properly under way, receive more modern equipment, and the Hart will then be considered as a back number. If this harried and crisis-blotched peace continues with us for a number of years one can even visualise the day when the clubs, in their turn, might each be allowed one or two outstandingly interesting types. I know a few amateurs who would have, even now, little difficulty with a Blenheim or a Battle.

Military Costs

ONE of these days, when I am in a more mathematical mood, I will try to work out the flying and maintenance costs of a machine like the Hart in comparison with ordinary light aeroplanes. The difference will, of course, be considerable, and it seems to be extremely doubtful whether the present C.A.G. subsidy figures, high though they are, would permit such a military type to be operated at an hourage cost which the members would be able to afford.

I do not think there is any doubt that plenty of established club members could be found to pay as much as £3 an hour for the privilege of flying something large, new, and interesting—particularly if they are permitted to take them away for reasonably protracted periods. At the cruising speed of the Hart, too, this hourage rate might be less expensive than that charged for ordinary light aeroplanes in pre-C.A.G. days. But the ground engineers would need to wire up the throttle gate if money were to be saved.

This suggested hourage figure is probably low to the point of absurdity, but in special circumstances I can see no reason why the subsidy should not be increased for what amounts to a third size of machine. At present two different figures are offered for training on light-weight and medium-weight types, and it would merely be necessary to introduce a third figure for heavy-weights. Additionally, however, it would obviously be essential to offer a higher "by the hour" figure, which at present is the same for the two existing classes.

The institution of a special heavy-weight class would at least solve the immediate and quite considerable problem of the provision of machines for those experienced members who wish to fly about the country and not just make landing circuits. These members are at present in the depths of despair, though the majority of the larger clubs are making a real attempt to keep one or two suitable machines in their fleet in reserve for their use. Whether it will be possible always to do so remains to be seen. The clubs cannot be expected to throw away good money even for the sake of satisfying their old supporters. Last Saturday, for instance, I was unable, for love or money, to obtain any sort of flying contraption—even for ten minutes' flying—at one of the very largest clubs.

INDICATOR.

Private Flying

FROM the CLUBS and SCHOOLS

LONDON

ONE hundred and sixteen hours, forty minutes were flown for the week ended September 24 at the London Aeroplane Club, and two members joined.

KARACHI

For the month of August the total flying amounted to 142 hr. 50 min., which figure included two hours' night flying. The ground engineers' section has been busy as usual.

ROMFORD

Last Saturday the new landing ground at Fairlop was officially opened. Instructional work accounted for 38 flying hours, and Miss M. Haseldine obtained her "A" licence.

BENGAL

With only one aircraft of its own and three privately owned machines, the Bengal Flying Club nevertheless achieved 85 hr. 5 min. flying for August, in spite of bad weather conditions. Mr. J. N. Ghose went solo.

C.A.S.C.

Very little flying was done over last week-end owing to poor visibility. Members of the Corps will be on duty at Cambridge on Saturday, October 8, when the aerodrome will be officially opened by Sir Kingsley Wood.

STRATHTAY

Owing to inclement weather flying for the week ended September 18 was restricted to 15 hr. Sixteen C.A.G. members are taking instruction, and Mr. G. C. Halley has been appointed assistant instructor.

CINQUE PORTS

Civil Air Guard members contributed 77 hours towards the flying total of 138 hours for the week ended September 18. The Leopard Moth was away at Le Touquet over the week-end. Mr. Mirielees and Miss Van den Bergh made first solos. The Club is to close for a fortnight for a staff holiday from next Saturday until Monday, October 17.

HAMPSHIRE

Three "A" licence candidates—Messrs. J. A. Aris, R. J. Lyons, and Dr. C. V. Salisbury—have successfully qualified. For three weeks ended September 23 a total of 188 hr. 55 min. flying was completed. Nineteen C.A.G. members are on the first *ab initio* course, and Messrs. M. Buxton and M. Moody have made their first solos.

BROOKLANDS

First solo flights were made by Messrs. Carr and Pownall, and 120 hours were flown by the club during the week. Mr. Clifford Mollison dropped in, and Mr. J. Sewell is leaving shortly to take up a position at Maidstone aerodrome. The Moss monoplane will be demonstrated next Sunday, and the tea dances will also start on that day.

HERTS AND ESSEX

Of the 800 C.A.G. applicants, thirty have started instruction and five are nearing the solo stage. Mr. E. Raymond Dutt has joined the club as assistant instructor. A total of 515 hr. 7 min. was logged for the month of August, and for the two weeks ended September 22 a further 191 hr. 30 min. were flown. Mr. S. N. Goddard made his first solo.

SOUTH COAST

Bad weather rather spoilt the dawn patrol at Eastbourne, but all the club machines took part. Preparations are being made for a competition for the club championship cup, which has been presented by Mr. F. C. White. Mr. Pashley has been busy on blind flying instruction, and Mr. P. Rankine made his first solo. Thirty-four hours' flying was put in. C.A.G. applications are still being received.

READING

Messrs. C. G. Gordon, E. Middleton, and D. Harrison are new flying members. Messrs. A. W. B. Heston and G. A. Jessett have gone solo, and Mr. Hoboken has arrived back from Sweden.

MARSHALL'S

At Marshall's Flying School a total of 85 hours represented the flying for the week ended September 25. This figure included cross-countries to Oxford, Hatfield, and Brooklands. Miss Pond has finished her "A" licence tests.

BORDER

Bad weather prevented several cross-country flights as well as a flight, arranged for the Mayor of Carlisle, to Belfast, where he was to attend a luncheon given by the Lord Mayor. For the first three weeks in September 96 hours have been flown, showing a slight increase over the same period last year. C.A.G. instruction is being carried out to a schedule, and the pupils are making good headway.

BARTON (BEDS)

At the Bedford School of Flying very good weather has been experienced and two members flew to Lausanne. Among the C.A.G. members four "A" licences have been obtained since September 1 by Messrs. G. W. Dicker, W. L. Stoddon, C. R. Tapper, and J. S. Sproule. The latter is, of course, co-holder of the British two-seater glider endurance record.

REDHILL

The result of the Harris Cup competition resulted in a draw between Messrs. C. J. Danby and D. S. Daines, with Mr. P. Rochford as runner-up. A dinner and the presentation of the cup by Mr. Harris was followed by a film show. During last week the club spent 141 hr. 40 min. in the air, and first solos were made by J. S. Helme and C. L. Armstrong. Another Puss Moth has been added to the club's fleet.

NORFOLK AND NORWICH

In anticipation of the C.A.G. rush, Mr. R. H. Henderson has taken up his duties on instructional work. Training of the first draft of pupils is in progress and arrangements for lectures are in hand for those pupils who cannot be given practical training immediately. The first social event of the season—the annual ball—will be held at the clubhouse on October 21. In the gliding section all the machines were in the air, and Mr. A. H. Colman tried out his new sailplane, a Kirby Gull.

JOHANNESBURG

During August the Johannesburg Light Plane Club flew 651 hours, exceeding the total for the previous month by nearly 140. Two members, Messrs. S. I. Becker and W. H. Gresty, obtained their "A" licences, and five made their first solo flights. Seven club machines attended the Lourenço Marques Air Rally, at which seventy-three machines in all attended early this month. On August 14 a formation-flying competition was held at Baragwanath, and three flights took part. The winners were judged as Messrs. Pessen, Williams, and Dunn.

MADRAS

The month of August brought welcome showers to Madras, and the khaki dust sheet so long laid over the aerodrome exchanged itself for green baize, to the great content of men and birds. Four members flew their first solos during the month—Messrs. Reddiar, Krishnan, Mathewes and Balasingham, and the first two have completed their "A" licence tests. Two annual competitions were held. The first, a cross-country for the cup presented by the Raja of Pithapuram, was competed for by twelve members and remains open for further entrants. The second, the Ames shield, was held on Sunday, August 28, with seventeen competitors. The winner was Mr. Law, the hon. secretary, with 83½ points, followed by Messrs. Davis, and Fernando.

Fairlop Beginnings

CHIGWELL Aerodrome, near Ilford, which may be considered as part of the Fairlop aerodrome plan for London, was officially opened by Mrs. F. G. Miles. This aerodrome will be used by the Romford Flying Club, whose previous headquarters were at the old Romford aerodrome, and who are concentrating rather seriously on the Civil Air Guard scheme. Mrs. Miles is, of course, one of the C.A.G. Commissioners. The ceremony was followed by the customary flying display.

In Rhodesia

MR. GEOFFREY L. PARBURY, who will be remembered by Broxbourne members, is doing good work as instructor to the Flying Club of Northern Rhodesia. The Club's Tiger Moth is in the air every day of the week, almost from sunrise to sunset. From Monday to Saturday it is at the Nkana aerodrome, which serves the residents of Nkana and Kitwe. On Sundays Mr. Parbury takes the machine to Ndola, where he gives instruction to members there and at Luanshya. The latter has as yet no aerodrome, but one may very soon be laid out.

The Club's charges are still necessarily on the high side—£4 an hour dual and £3 solo—but it is hoped that the new subsidy scheme, shortly to be announced, will enable the charges to be reduced.

More Prohibition

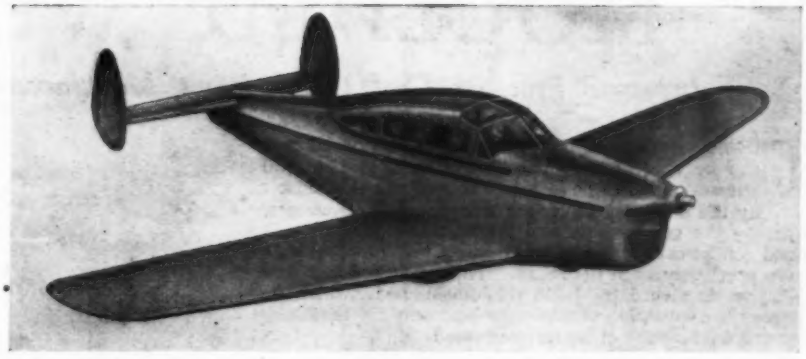
RECENTLY there has been a considerable increase in the number of prohibited areas in German territory adjoining the frontiers of Holland, Belgium, Luxemburg and France. Details of the areas affected are published in *Notice to Airmen* No. 203, but (provided that passage across the frontiers is in any case still possible when *Flight* appears), pilots are advised to pay particular attention to the demarcation of these areas. A new edition of *Foreign Air Regulations Handbook* No. 12 is in course of preparation.

G.A.P.A.N. Discussions

THE Guild of Air Pilots and Navigators announces that the first of the winter series of dinners and discussions will take place at the Royal Aero Club at 8.30 p.m. on Monday next, October 3. The subject will be "Insurance and the Commercial Pilot," and the discussion will be opened by Mr. C. F. H. Gough, a director of Saville, Gough and Hay, the insurance brokers.

All commercial pilots are welcomed, whether members of the Guild or not. Tickets are 3s. 6d.

UNITWIN in ACTION



THE NEW VEGA: A drawing of the first production machine to be fitted with the Unitwin engine as it should appear when it is completed early next year. The power unit is made up of two 260 h.p. Menascos and the machine will carry five or six people.

FROM time to time during the past year we have given details of the developments of the Unitwin engine installation, which, in its initial form, consists of two Menasco engines of 260 h.p., each of which is mounted side by side and drive a single airscrew through a controllable gearing and clutch arrangement.

This idea has distinct possibilities since drag is considerably reduced, the failure of one engine does not involve the other in more than its natural additional work, and the whole arrangement, in normal operation, permits proper synchronisation and consequent efficiency.

Tests were carried out in a modified Altair, and now the Vega Airplane Company, a subsidiary of the Lockheed Corporation, has announced some details of the first machine to be designed round this new type of power unit. This machine will be known as the Vega, and will be an all-metal low-wing monoplane carrying five to six persons. The power unit will, of course, have a single constant-speed airscrew, which will enable the maximum efficiency to be obtained where one or both engines are providing the power. Another interesting feature of the machine is a retractable tricycle gear. In its retracted position all three wheels will still be available for emergency landings.

The fuselage will consist of two main sections, the forward being constructed of steel tube, from which is mounted the aluminium alloy cabin shell, while the rear section will be a semi-monocoque of aluminium alloy. The two main panels of the wing are bolted directly to the fuselage structure so that there will be no centre section. Needless to say, split-type flaps are to be fitted.

No estimated performance figures are given in detail, but it is suggested that the machine will have a top speed in excess of 200 m.p.h. and will have a non-stop cruising range of 1,000 miles. The estimated gross weight is 5,400 lb. Production is now under way and the first machine is expected to be completed during next January.

Capt. Balfour's Tour

CAPT. HAROLD BALFOUR, Under-Secretary of State for Air, returned last Sunday from a three weeks' tour of the R.A.F. stations in the Middle East. He and his staff flew in one of the two D.H.86 machines of No. 24 (C) Squadron which are used by the Air Council. The trip covered about 12,000 miles in 87 flying hours, and the Under-Secretary was able to spend three days in Egypt, one day in the Sudan, three days in Kenya, one day in Palestine, and one in Malta. The Palestine deviation was made in a Valentia troop-carrier, and from Nairobi to Mombasa he flew in a Wellesley.

Capt. Balfour said in an interview that he was much impressed by the spirit and enthusiasm of the R.A.F. units which he saw. "We had been augmenting our strength in the Middle East Command, and so quarters were sometimes cramped, but the keenness of all ranks was very marked. He was also much impressed by the routine inter-command flights which are undertaken every year. He met one of them at Aboukir, No. 55 (B.) Squadron, who had come down in their Vincents from Iraq. He also witnessed five Valentias arriving on trooping duties, each bringing some twenty persons from Iraq for Home leave.

The arrival at Kolundia aerodrome outside Jerusalem was interesting, as the Valentia was not allowed to land until an escort of armoured cars and a tender full of armed airmen had taken up position at the approaches to the aerodrome. Capt. Balfour told a story of a pilot in a Gladiator who saw a lorry travelling along a road in Palestine and dived down to find out its identity. The lorry promptly stopped and the occupants got out and opened fire. The pilot thereupon used his four guns and killed quite a number of the rebels.

DAVID LLEWELLYN

IT is with great regret that *Flight* records the death of Flying Officer David Llewellyn, R.A.F.O., in an accident at Lympne Aerodrome on September 21. The cause of the fatality is a mystery, and no light could be shed upon it at the inquest. F/O. Llewellyn, who was Chief Instructor at the Cinque Ports Club, was giving instruction in one of the club Swallows to Lieut. J. B. Kitson, Royal Horse Guards. According to eye-witnesses, the machine was making a circuit of the aerodrome at 150-200ft. when it suddenly dived into the ground. Both occupants were instantaneously killed.

F/O. Llewellyn, who was the only son of Sir William Llewellyn, President of the Royal Academy, was a pilot well known to the general public by reason of a number of long-distance record attempts which he had made.

In 1935, flying in a Hendy Heck with Miss Jill Wyndham, he broke Miss Amy Johnson's Cape-England record by 18 hr. 48 min., lowering the time to 6½ days.

In 1936 he flew from England to Johannesburg, by comparatively easy stages, in a 40 h.p. Aeronca, with the object of demonstrating how cheaply such a flight might be made.

Llewellyn, acknowledged as a pilot of sound judgment not given to taking unjustifiable risks, was the victim of a quite undeserved amount of bad luck. Machine trouble and bad weather robbed him of success in attempts on both the outward and homeward Cape record last year, and in the Johannesburg Race he was forced by weather to put down his Vega Gull on the shores of Lake Tanganyika when he looked a likely winner.

Before almost every one of his long-distance flights he was dogged by weather conditions that compelled him to postpone his start day after day.

Ater leaving the Service he became an instructor at Hanworth and a director of the London Air Park Flying Club. About a year ago he took up his post as Chief Instructor at Lympne. Lately he felt that record-flying had lost much of its value, commercially and otherwise, but a year or so before he had planned a flight to Mauritius with a woman co-pilot, Miss Planel, and this project was shortly to have been put into effect.

To his widow and eight-year-old son *Flight* extends its sincerest sympathy

MOULDED WOOD

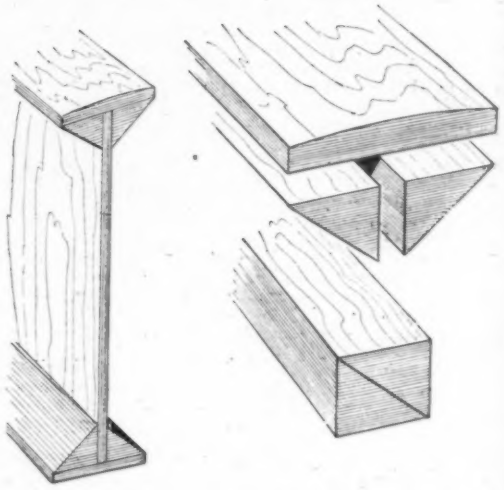
Improved Processes Lead to Important Manufacturing Advantages

THE day when the structural strength of an aeroplane can be made everywhere proportional to the local stresses seems to have been brought one step nearer by the discovery of certain manufacturing processes, whereby the compression and impregnation of laminated wood can be carried out at much lower temperatures than have previously been necessary. The secret lies in a new adhesive developed by Jablo (Holdings), Ltd., which requires the application of moderate heat only for the bonding and final setting of compressed wood.

The principles of the original Jablo compressed and impregnated wood laminated construction were explained in an article in *Flight* of December 16, 1937. By the new low-temperature setting process it becomes possible to produce such components for the primary structure of an aeroplane as wing spar flanges, streamline struts, stressed skins, etc., without the use of splices, as the term is ordinarily understood.

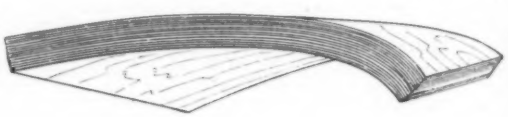
By mixing the ingredients of the new chemical glue in a particular proportion, the adhesive can be made in such a way that thermoplastic characteristics remain during the bonding of the compressed material, and the final setting is obtained after either a second or third operation with a maximum temperature of 100 deg. C.

The new method permits of manufacturing long components, such as spars, wing skins, etc., in continuous lengths by repeated and "staggered" pressing operations and heat treatment. For such operations comparatively small and cheap dies can be used in small presses.



A spar made of moulded wood. The flanges are strips of triangular section cut from a rectangular block and joined by a covering strip, itself of moulded compressed wood. The spar web is, of course, made of less density than the flanges.

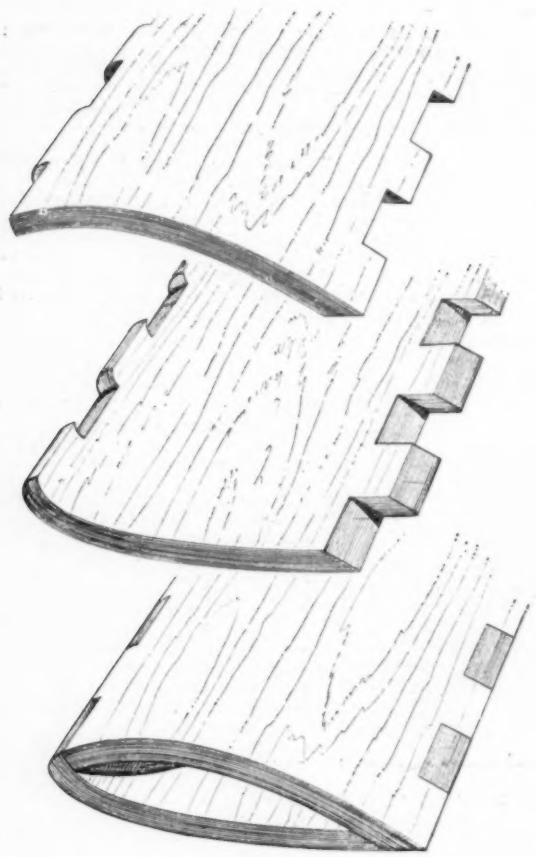
One may assume that yet another advantage of the lower setting temperature will prove to be that the compressed wood itself will not be "embrittled" (if we may coin a word) to the same extent as when the setting temperature is much higher. This should mean the retention by the material of a higher degree of natural sound elasticity.



A twisted skin covering in moulded compressed wood is quite within the capacity of the new process.

A company under the name Moulded Components (Jablo), Ltd., has been registered for the purpose of exploiting and developing the Jablo patents. The manufacture of Jablo moulded material is being undertaken in conjunction with the Aeronautical Panel and Plywood Co., Ltd., whose extensive manufacturing resources have been extended to include the new processes.

Certain aircraft components made experimentally by the new moulding method are shown in the sketches.



Section of a streamline strut made of moulded impregnated compressed wood. Note the dovetail joints which secure the two halves of the strut together.

Aero Golfing Society

THE autumn meeting of the Aero Golfing Society for the Cellon trophy was held at Sudbrooke Park, Richmond, on Wednesday, September 21. The winner was Mr. R. Ashley Hall, 80 less 18=62. Other returns were: Lt.-Col. Sir Francis Shelmerdine, 82 less 16=66; Cdr. H. E. Perrin, 88 less 16=72; Mr. G. F. Roberts, 75 less 3=72.

In the four-ball foursomes, Cdr. Perrin and Mr. A. J. Mitchell-Clarke were 10 up on bogey. Lt.-Col. Sir Francis Shelmerdine and Mr. R. Ashley Hall were second with 7 up.

September 29, 1938. Supplement to FLIGHT

THE AIRCRAFT ENGINEER

No. 152. (Volume XVI No. 9) 13th Year September 29, 1938.

SPEED EFFICIENCY

How it is Calculated : High "Figure-of-Merit" of the D.H. Albatross

By R. M. CLARKSON*

POSSIBLY the most striking feature of the Albatross high-speed liner is the aerodynamic cleanness of the design—good lines, low-drag power units, thin wing, general absence of excrescences such as rivets and tap joints, completely retracting undercarriage, etc.—which is at once reflected qualitatively in its cruising performance, 210 m.p.h. or so, with 1,300 b.h.p. This is obviously a remarkable achievement for an aircraft of such dimensions. The scientifically minded will naturally want to know *how* clean the Albatross is. This raises the old question of how to measure "speed efficiency." Perhaps the best way for modern clean monoplanes is the method first suggested by Professor B. Melvill Jones in 1929, now endorsed by the authorities, and widely used. The total exposed surface, or "wetted surface" as it is called, of the whole aircraft is measured and then its skin-friction drag at cruising speed is calculated. If the surface is perfectly smooth this would represent the minimum possible drag of the aircraft if it were ideally streamlined. If from the measured cruising speed, power, etc., the actual total drag (excluding induced drag) of the aircraft is calculated, then the ratio of this to the skin-friction drag constitutes a kind of figure-of-merit for the aircraft, expressing how near the ideal it approaches. This ratio,

$$\frac{\text{Total Drag—Induced Drag}}{\text{Skin Friction Drag}}$$

is, of course, always greater than 1.0, and the closer it approaches to 1.0, i.e. the smaller it is, the more efficient is the aircraft.

Applying this method of comparison to the Albatross, we find that in the standard unpolished condition with complete external equipment (de-icers, loop aerial, fairlead, etc., etc.) it has a figure-of-merit of 1.85, a remarkable achievement. For comparison it may be pointed out that a figure-of-merit of 1.93 is attained by a certain single-engined water-cooled low-wing monoplane of Continental design, in a highly polished condition without any external equipment, referred to overleaf as Aircraft "A."

The figure of 1.85 means that the drag due to form, interference, excrescences, cooling, control-surface and cowling joints, windscreen, tail wheel, exhaust pipes, air intakes, aerials, and a host of the necessary etceteras, is no more than 85 per cent. of the necessary skin-friction drag of the aircraft, or 46 per cent of the total drag, a remarkably low figure.

Here are some figures-of-merit for several other well-

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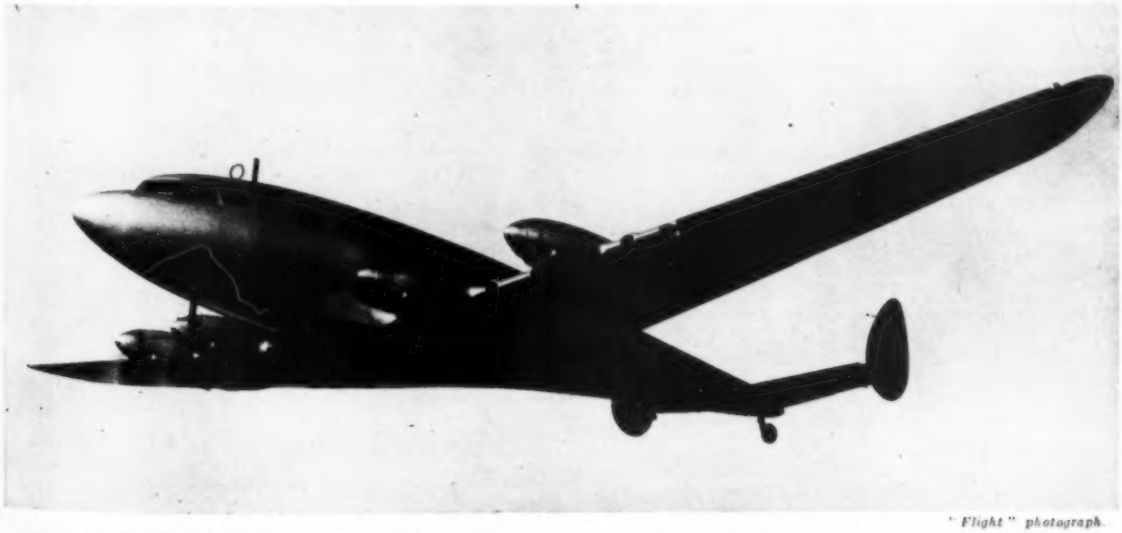

"Flight" photograph.

AERODYNAMIC CLEANNESS. "The cruising speed of the D.H. Albatross is 81 per cent. of what it would be if the machine were ideally streamlined."

known types of aircraft with the Albatross included for comparison :—

D.H. Albatross	1.85
Aircraft " A "	1.93
D.H. Comet	1.93
Best modern low-wing radial-engined liners	2.35
Low-wing single-engine cabin monoplane, fixed undercarriage	2.5

It will be noticed that the Albatross is considerably better than average modern radial-engined air liners, and even better than the Comet.

It is instructive to express the figure-of-merit in terms of speed. If this is done it is found that the cruising speed of the Albatross is roughly 81 per cent. of what it would be if the machine were ideally streamlined, i.e. it is only losing 49 m.p.h. due to interference, excrescences, etc., etc. Expressing this in another way, we might say that if the 4,000-odd square feet of exposed surface of the Albatross were represented by a 2,000 sq. ft. pane of glass (i.e. total surface 4,000 sq. ft.) of negligible thickness and approximately the same span and weight as the Albatross and then towed edgewise through the air by 1,300 b.h.p. it would travel only 49 m.p.h. faster than the Albatross.

To the air-line operator this remarkable aerodynamic efficiency means that, with the Albatross, he can achieve a hitherto unequalled combination of economy (expressed as ton-mileage of payload per gallon of fuel) with high cruising speed.

It may be stressed that the fine lines of the Albatross which have produced its high economy factor were inspired by the original requirements of transatlantic mail-carrying, in which a range of 2,500 miles against a continuous 40 m.p.h. headwind had to be achieved with a payload of 1,000 lb.

Calculating the "Figure-of-Merit"

There is nothing original in the Streamline " figure-of-merit " or in the method of calculating it. All that is attempted here is a brief discussion of a convenient way of arriving at its value, suitable for routine calculations.

Since Figure-of-Merit $= \dfrac{\text{Total Drag—Induced Drag}}{\text{Skin Friction Drag}}$ the calculation falls naturally into two parts :—

1. Calculation of the Denominator in the above fraction for the aircraft in the conditions under which the level speed was measured.
2. Calculation of the Skin Friction Drag of the aircraft.

For 1 the following quantities must be known : Altitude, speed, b.h.p., airscrew efficiency, total weight and equivalent monoplane span. From these the horse power available and horse power used in overcoming induced drag are evaluated. The horse power used in overcoming total friction drag then follows as the difference between these, and from it the equivalent drag area of the aircraft is obtained.

The working is best carried out in tabular form as shown :—

$\Sigma C_dA = \dfrac{\text{H P.}_F}{\sigma(V/52.8)^3}$ = Equivalent Drag Area of Aircraft or Area (sq. ft.) of normal plate (at C_d = 1.0) having the same drag as the aircraft.

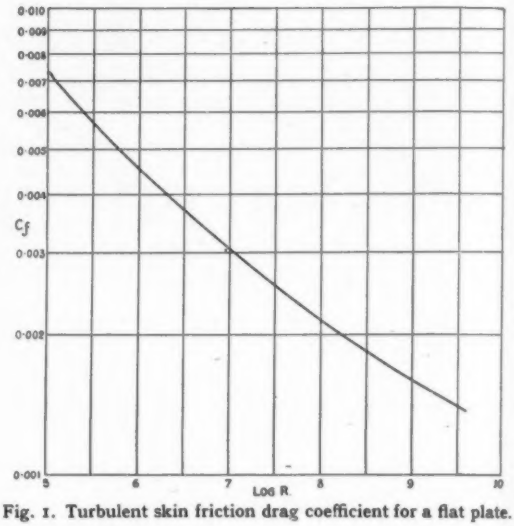

Fig. 1. Turbulent skin friction drag coefficient for a flat plate.

In calculating skin friction drag it is assumed that the boundary layer is completely turbulent,* and therefore that the skin friction drag coefficient for any component of the aircraft (wing, tailplane, etc.) is related to the local Reynolds Number in accordance with the well-known von Karman law (Fig. 1). It is, therefore, only necessary to measure up the " wetted surfaces " and Reynolds Numbers of all the various components, evaluate their skin friction drag coefficients and hence their equivalent drag areas for skin friction. The procedure is indicated in Table II on the next page.

In this table :—

ν = Kinematic Viscosity at 11,000ft.
L = Mean Chordwise Dimension in feet.
R = Reynolds Number $= \dfrac{1.46\ V.L.}{\nu}$
C_f = Turbulent Skin Friction Coefficient from Fig. 1.
A_f = Measured Wetted Surface in square feet.
C_fA_f = Equivalent Drag Area for Skin Friction, or Area (sq. ft.) of normal plate (at C_d = 1.0) having the same skin friction drag as the aircraft.
ΣC_dA — from Table I.
K = Streamline Figure-of-Merit.

It will be seen that for making the above calculation, in addition to the usual information on speed, power, weight, etc., it is necessary to have a general arrangement drawing of the aircraft in order to measure the wetted surfaces. However, it has been found that if care is taken a reasonably accurate determination can be made from quite small scale

TABLE I.

Aircraft.	Speed. m.p.h. V.	Stand. Altitude.	σ	B.H.P.	Airscrew Efficiency	H.P. av.	W	S	W/S^2	H.P.$_i$	H.P.$_F$	ΣC_dA	Remarks.
		ft.					lb.	ft.				sq. ft.	
D.H.91	212	11,000	0.715	1,304	.853	1,113	29,500	105	2.67	175	938	20.2	Weak mixture cruising.

In the above table :—

σ = Relative Atmospheric Density.
H.P. av. = H.P. available = η b.h.p. = H.P. required.
H.P.$_i$ = Induced Drag H.P. $= \dfrac{W.W/S^2}{3\ V.\sigma}$ (assumes elliptical distribution)
H.P.$_F$ = Total Friction Drag H.P. = H.P. av.-H.P.$_i$

* Probably pessimistic as there will be many parts of the aeroplane where the transition point is behind the L.E.

TABLE II.

Aircraft.	Speed. m.p.h. V.	Alti-tude.	ν	Item.	L	R	log R	C_f	A_f	C_fA_f	ΣC_fA_f	ΣC_dA	$K = \frac{\Sigma C_dA}{\Sigma C_fA_f}$
		ft.			ft.				sq. ft.				
D.H.91	212	11,000	.00011	Wing	10.6	1.60×10^7	7.20	.00283	1,868	5.29	10.90	20.2	1.85
				Fuselage ..	71.0	1.07×10^8	8.03	.00213	1,492	3.18			
				Vertical tail ..	4.4	6.62×10^6	6.82	.00325	153	0.50			
				Horizontal tail.	7.0	1.05×10^7	7.02	.00301	335	1.01			
				Outbd. Nacelle	18.0	2.71×10^7	7.43	.00260	148	0.39			
				Inbd. Nacelle..	21.0	3.16×10^7	7.50	.00255	182	0.46			

G.A.s such as are frequently reproduced in *Flight*. In the absence of more accurate information it is sometimes useful to know that the wetted surface of a fuselage is rarely more than 0.78 and less than 0.62 times that of the circumscribing cylinder (i.e. L × P, where L = length and P = maximum perimeter). The higher figure corresponds to fairly parallel-sided fuselages (Comet, Douglas, etc.), the lower to more irregular shapes in side view (Leopard Moth, etc.).

The wetted surface of wing or tail surfaces is obviously about twice the area—though many people take it a little more accurately at 2.06 for wings and 2.03 for tails to allow for the increased perimeter. The b.h.p. should be determined as accurately as possible with due correction for the effect of forward-facing intake or exhaust propulsion, etc.

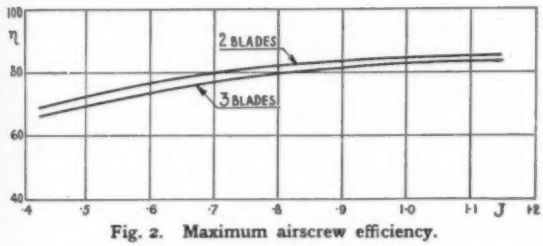

Fig. 2. Maximum airscrew efficiency.

It will be necessary to know the diameter and r.p.m. of the airscrew in order to estimate its efficiency, and it is preferable to obtain this off a general η-J envelope curve (Fig. 2) and not attempt to correct it for any blade shape, section, compressibility, or nacelle interference effects. Similarly the induced drag H.P. should not be corrected for any known non-elliptic lift grading, etc. In this way the manipulation of the method is much simplified and the Streamline Figure-of-Merit (K) ceases to be solely concerned with the aerodynamic cleanness of airframe surface, but will automatically also reflect the effects of a host of other factors over which the designer has control; in other words, it becomes an index of what he has been able to achieve with the materials at his disposal.

What we have called, for want of a better name, the "Streamline Figure-of-Merit," has been criticised on the grounds that it tends to make wetted surface appear as a desirable quantity, whereas it is clear that any reduction of wetted surface which can be effected without increase of form drag or interference is obviously advantageous. This criticism is to a certain extent justified, but all figures-of-merit, handicap formulae or mathematical expressions for efficiency are open to similar objections, and on the whole this basis of comparison for speed looks like being the most logical and generally satisfactory now and for some time to come.

Broadly speaking, the speed attained by an aeroplane of given horse power is determined by its size (which is measured in terms of wetted surface) and the degree to which it has been streamlined (expressed by the figure-of-merit).

Many people prefer to take the reciprocal of K and express it as a percentage, calling it the Streamline Efficiency. The cube root of this quantity is interesting because it represents a speed ratio :—

$$\sqrt[3]{\frac{1}{K}} = \frac{\text{Actual Speed}}{\text{Streamline Speed}}$$

One final point. For certain purposes of comparison it is sometimes desirable to omit the effect of Reynolds Number, i.e. to compare aircraft on a basis of constant skin-friction drag coefficient, thereby not penalising the large or fast aeroplane by expecting it to have a lower drag on that account. Under these circumstances the calculations of Table II are considerably simplified.

TECHNICAL LITERATURE

SUMMARIES OF A.R.C. REPORTS

REPORTS published by His Majesty's Stationery Office, London, which may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester, 1; St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through booksellers.

APPROXIMATIONS TO FUNCTIONS AND TO THE SOLUTIONS OF DIFFERENTIAL EQUATIONS. By R. A. Frazer, B.A., D.Sc., W. P. Jones, B.A., and Sylvia W. Skan, of the Aerodynamics Department, N.P.L. R. & M. No. 1799. (33 pages and 6 diagrams.) March 19, 1937. Price 4s. 6d. net.

The paper provides comparisons between three known methods of approximation, which are referred to for brevity as (i) collocation, (ii) least squares, (iii) Galerkin's method. The term "collocation" is here used to mean the act of assigning the error at given points or stations: in applications to differential equations the normal procedure is to make the error in the differential equations zero at specified stations.

Part I is restricted to linear problems including approximate representations of some simple functions and examples of solutions of linear differential equations. The methods are particularly valuable for the calculation of characteristic numbers (e.g., natural frequencies). Part II discusses briefly certain difficulties connected with the solution of non-linear problems by collocation, and contains a description of a method for the numerical solution of simultaneous non-linear algebraic equations.

The general conclusions can be summarised as follows:—(1) As the number of disposable constants is increased, the sequences of representations derived by the three methods will either all converge to the same limit, or else will all diverge. (2) The methods may be expected to be successful provided the total interval of representation or solution is not taken too large; (3) Galerkin's method is usually the most rapidly convergent, but collocation has the advantage of simplicity.

NOTES ON A METHOD OF ANALYSIS OF GROUND RUN DURING TAKE-OFF. By S. B. Gates, M.A. R. & M. No. 1820. (13 pages and 4 diagrams.) February 27, 1937. Price 2s. net.

The ground run is necessarily much less precise than, for instance, the top speed or the stalling speed, since it depends to a large extent on how the aeroplane is piloted. The attitude on the ground run may be anything from that in which the tail is just off the ground to that in which the tail is so high that the aeroplane is about to fall on its nose; and the speed of leaving the ground may be anything greater than the stalling speed at the ground. Where the human element enters so strongly some resort to empiricism is unavoidable, and in the circumstances it seemed best to the author to strip the theory of all elaboration and look for a formula which, while having some logical ground, can be calculated quickly from quantities available to the designer. The proof of such a formula must be its applicability to measured ground runs, and in the circumstances high accuracy cannot be hoped for. A simplified analysis of this kind is made and is used as a framework in which the measured ground runs of a number of aircraft are set out.

The probable error of the formula given in the report seems to be less than 10 per cent. It seems suitable for prediction if the take-off speed can be estimated.

RELAXATION METHODS APPLIED TO GRID FRAMEWORKS. By Derman Guy Christopherson. R. & M. No. 1824. (12 pages and 3 diagrams.) December 14, 1937. Price 2s. net.

The problem in this paper is a flat grid transversely loaded—that is, any system of girders rigidly jointed and all in one plane.

Two examples are discussed (i) a simple rectangular grid, which serves to reveal the essentials of the problem; and (ii) an actual wing structure of spars and interspar bracing members. Grids as defined present somewhat different problems according as (a) they are rigidly supported at their boundaries, or (b) have one or more boundaries free to move, the extreme case being a cantilever structure. The examples given in the report illustrate both problems.

(*Other summaries of A.R.C. Reports on page 64.*)

LANDING STRESSES

A Qualitative Estimation of the Forces on a Flying Boat Hull *

By D. FRASER, B.Sc.

AN unfortunate feature of flying boats is the large percentage of structural weight that must be put into the hull, not for the purpose of performing useful work under flight conditions, but only to withstand the loads imposed by the water during take-off and landing. This enforced robustness is undoubtedly useful, especially in the case of Service craft, as it enables the flying boat to withstand heavy buffeting in rough weather at its moorings, or after a forced landing in the open sea, but in general the designer must dislike all non-payload that is necessary to give strength at only comparatively short and infrequent intervals. Knowledge of the stresses which the hull has to withstand, and which would enable more exact design of its strength, would be particularly welcome.

The problem of estimating the stresses arising in a hull during take-off and landing presents very many difficulties, and hitherto designers, in this country and America at least, have relied on empirical laws founded on past experience. The present British requirements correspond with the American ones, and take account of a tail-up landing, a two-wave landing, and a pressure on the hull bottom. In these requirements the only varying parameters are the mass properties and the linear dimensions of the flying boat. While these requirements have been satisfactory in the past, and are probably satisfactory at present, one is bound to question their extrapolation into the future now that developments appear to be moving along less conservative lines, and now that one may expect greater differences in landing speeds and wider variations of weights and geometrical properties. An empirical law which may be satisfactory within a given range may be far wrong at points outside that range. Some further consideration of the probable nature and magnitude of the stresses due to landing and take-off seems to be very necessary.

What is the nature of these stresses? There is a strong similarity between the loads produced by landing and take-off, both being of an impulsive nature. These impulsive loads vary for their duration both in magnitude and point of application, and produce a wide range of vibrations in the hull, from the pitching oscillation of the craft as a whole at one end of the scale, to the drumming of the bottom plating and the minor vibrations of the stiffer members of the hull at the other. It seems probable that these two extremes are the most important as concerns stresses set up. If we concentrate on the strength of the bottom plates under impulsive loads, the strength of the minor frame members under average sustained pressures, the strength of the hull as a whole, and the superstructure under an average impulsive load, we shall probably not omit much of importance. The actual water impulses would seem to be absorbed by the elasticities of the plates, the frames, the hull as a beam, and the superstructure, and by the energy of the changes of momentum of the flying boat, linearly and rotationally. The question of elastic absorption is receiving consideration in several countries, and experiments are being made particularly on the strength of bottom plating. It is proposed to deal here only with the question of the stresses in the hull as a whole.

There exists a mass of curiously uncorrelated information, experimental and theoretical, on the water loads on a hull. In the experimental work, however, agreement seems

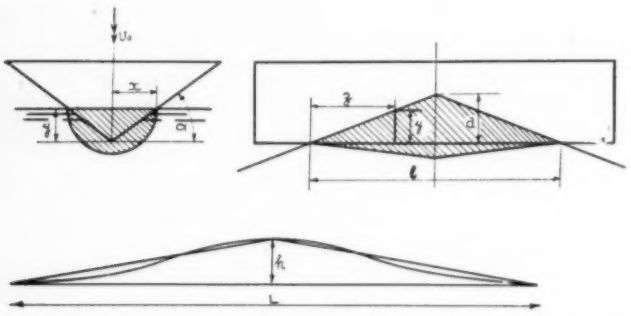

Fig. 2. Comparison of trochoidal and triangular waves Length-to-height ratio 12.

Fig. 1 (left). A wedge-shaped body dropping into a wedge-shaped wave provides a simplified case, and is used as a basis for obtaining qualitative results.

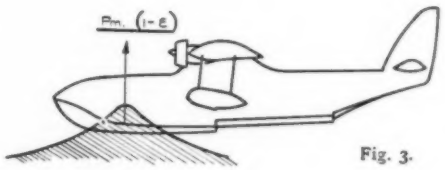

Fig. 3.

general on the following points:

(i) The worst loads occur in landing, and the magnitude of the average sustained hydraulic pressure varies as

(*a*) The weight (or the bottom area, which also varies roughly as the weight owing to take-off considerations);
(*b*) the landing speed;
(*c*) the angle of the bottom;
(*d*) the angle of drift (which is of the same nature as (*c*) above).

(ii) The distribution of the loading is (*a*) beamwise—most intense near the keel, becoming less as the impulse travels up towards the chine, and (*b*) keelwise—large pressures may occur at the bow and stern, but generally the pressures are most severe at points lying between the main step and a distance forward of about one-third the length between bow and main step.

(iii) The elasticity of the structure is a criterion which is of much greater importance with a flat angle of bottom than with a sharp V-bottom—naturally. There is considerable disagreement between model and full-scale tests.

(iv) The energy of landing is largely absorbed by minor inertia and elastic effects; some, of course, going to the formation of waves. The maximum accelerations recorded in the hull are 4.5 g vertically, 1 g aftwise, and 0.5 g beamwise. In this connection it is interesting to note that due to elastic effects the accelerations in the superstructure may be greater than those in the hull.

The theoretical work is also mainly in agreement with the foregoing. Pabst concludes that, for a sharp bottom angle, elasticity of the float bottom in a float seaplane has practically no effect on the shocks transmitted to the fuselage and that the seaway and type of landing are of

* *This article is published by permission of the Air Ministry, but the author is alone responsible for all statements made and opinions expressed in it.*

fundamental importance. Another relevant theoretical treatment of the problem of the deflection of unsupported beams under variable loads infers that the loss of energy due to landing shock goes mainly to local stresses in the hull plating and to the formation of water waves; and that the longer the duration of the hydraulic impact, the less the energy absorbed by the flexure of the hull. Further, the influence of structural elasticity on the water reaction, and the motion in heave, is small.

Simplifying Assumptions

The author has attempted a solution, along lines suggested by von Karman, of the problem of the maximum force acting on a hull in landing. A simplified case of a wedge-shaped body dropping into a wedge-shaped wave and still water, respectively, has been considered in an attempt to obtain not quantitive but qualitative results. The method used has been to equate the initial momentum of the wedge-shaped body to its later momentum plus the momentum of an "equivalent mass" of water. This method may be applied to the landing case for a flying boat by making the following assumptions:

(*a*) The bottom of the hull is the shape of a triangular prism.

(*b*) The mass and distribution of the water in the crest of a trochoidal wave is the same as that in the "crest" of a prism whose section is a triangle having the same height as the wave, and having a base equal to the length of the wave (*see* Fig. 2). This is approximately true if the length-to-height ratio of the wave is about 12 or more. The value of this ratio is generally about 25 for moderately rough weather.

(*c*) The momenta of the particles in the wave, due to their rotation, can be neglected. Consideration of trochoidal wave theory will show that these momenta tend to balance out on either side of the crest.

(*d*) The "equivalent mass" of water at any submerged unit length along the wedge-shaped body is that mass of water contained in a semi-cylinder having unit length and a diameter equal to the submerged breadth of the wedge. This, implicitly assumes two-dimensional flow in the water.

(*e*) Only vertical momenta need be considered.

This solution (*see* Appendix) is that the maximum value of the vertical impulsive force is

$$P_{mw} = K_1 v_0^2 \sqrt[3]{\rho \frac{L}{h}\left(\frac{W}{g}\right)^2 \cot^2 \alpha}$$

for the "wave" case, and

$$P_{mc} = K_2 v_0^2 \sqrt{\rho l \frac{W}{g} \cot^2 \alpha}$$

for the "calm water" case, where

K_1 K_2 = constants.
v_0 = velocity of descent.
ρ = density of water.
L/h = length to height ratio of wave
W = weight of flying boat.
α = angle of V-bottom.
l = submerged length in calm water.

Fortuitously, where the actual derived values of the constants are used, there is some quantitive agreement with experimental results. Thus, for a typical hull, the maximum average pressures on the hull bottom as derived by the writer's method are $0.025\, v_0^2$ and $0.015\, v_0^2$ for a "wave" and "calm water" landing respectively, and according to one experimental formula it is $0.045\, v_0^2$.

The variation of P_m with $W^{\frac{2}{3}}$ and $W^{\frac{1}{3}}$ appears reasonable. Generally the area of the planing bottom varies roughly as the weight, so that pressures on the bottom will vary approximately as $\frac{1}{W^{\frac{2}{3}}}$ and $\frac{1}{W^{\frac{1}{3}}}$. By comparing the maximum average pressures in landings on similar types of waves and in calm water respectively over bottoms of flying boats having the same angle of bottom but different weights, the truth or untruth of this law may possibly be checked.

Variation with $\cot \alpha$ in "calm water" landings appears to be borne out by some of the experimental work, and similar experiments with a static wave confined in some friable substance might be used to check the $\cot \alpha^{\frac{1}{2}}$ variation. The term v_0^2 is very reasonable, and is again borne out by experimental work.

The effect of wave shape $\left(\frac{L}{h}\right)^{\frac{1}{3}}$ seems insignificant, which does not satisfy Pabst's findings as to the importance of the seaway. This might also be studied experimentally by the method suggested above.

Having made an attempt at finding this impulsive force on the hull, we are faced with the more difficult determination of what bending moments and shear loadings it will produce on the hull. A certain fraction of the load, say ϵP_m, will be absorbed in the minor elasticities, so that the shear force will be $(1 - \epsilon)P_m$. The point of application of the impulsive force has also to be estimated, and the author can only suggest that for stressing purposes, this should be determined by consideration of the bending strength properties of satisfactory extant hulls. At present it is the value of $(1 - \epsilon)$ which is most indeterminate, and one of the theoretical values given which amounts to $(1 - \epsilon) \leqslant 0.1$ seems very low.

With all these doubtful quantitive points, this note would then appear at first sight to be valueless, except in so far as it should prove provocative. However, it is felt that, if the formulae given could be shown to be approximately correct in a qualitative sense, by the methods suggested or other methods, then they might be given a quantitive value by reference to experience of what has proved satisfactory strength in past and present designs of hulls, and their extrapolation for future use would not be as dangerous as that of purely empirical formulae.

Appendix

FORCE ON TRIANGULAR PRISM DROPPED INTO PRISMATIC WAVE

Assume that a solid prism of triangular section is dropped into a wave, as shown in Fig. 1.

Let W = weight of prism.
v_0 = initial vertical velocity of prism.

Then the initial momentum

$$= \frac{W}{g} v_0$$

Assuming two-dimensional flow only, the "equivalent mass" of water is that of a semi-cylinder of diameter $2x$, and if dz is the length of an element of the prism then

$$\text{Equ mass} = \frac{\pi}{2} \rho x^2 \, . \, dz$$

$$= \frac{\pi}{2} \rho y^2 \cot^2 \alpha \, . \, dz$$

where ρ = density of the water.

Take as an approximation to a trochoidal wave a prism of triangular cross-section, Fig. 2, with

base L = length of wave
height h = height of wave

$$\text{then } y = \frac{2z}{l} \, . \, d$$

$$\text{Equ. mass} = 2 \int_0^{l/2} \frac{\pi}{2} \rho \cot^2 \alpha \frac{4z^2}{l^2} d^2 \, . \, dz$$

$$= \pi \rho \cot^2 \alpha \frac{4d^2}{l^2} \times \frac{1}{3} \frac{l^3}{8}$$

$$= \frac{\pi}{6} \rho \cot^2 \alpha \, d^3 \frac{L}{h}$$

Then at a time t the momentum will be

$$M = \left(\frac{W}{g} + \frac{\pi}{6} \rho \cot^2 \alpha \, d^3 \frac{L}{h}\right) v = \frac{W}{g} v_0$$

but $$\frac{dy}{dt} = v = \frac{v_0}{1 + \frac{\pi\rho g \cot^2\alpha L}{6Wh} d^3}$$

and $$\frac{d^2y}{dt^2} = \frac{d}{dy}\left[\frac{1}{2}\left(\frac{dy}{dt}\right)^2\right] = \frac{d}{dy} \cdot \frac{1}{2} \cdot \frac{v_0^2}{\left(1 + \frac{\pi\rho g \cot^2\alpha L}{6Wh}\right)^2}$$

put $$C = \frac{\pi\rho \cot^2\alpha L}{h}$$

then $$\frac{d^2y}{dt^2} = -\frac{v_0^2}{\left(1 + \frac{1}{6} \cdot \frac{Cg}{W} d^3\right)^3} \times \frac{1}{2}\frac{Cg}{W} d^2$$

Therefore the force P retarding the prism is given by

$$P = \frac{W}{g}\frac{d^2y}{dt^2} = -\frac{\frac{1}{2}Cd^2v_0^2}{\left(1 + \frac{1}{6}\frac{Cg}{W}d^3\right)^3}$$

and P reaches its maximum when $\frac{dP}{dy} = 0$.

Put $A = \frac{1}{2} Cv_0^2$

$B = \frac{1}{6}\frac{Cg}{W}$

then $$P = \frac{Ad^2}{(1 + Bd^3)^3}$$

and $$\frac{dP}{dy} = \frac{2Ad(1 + Bd^3)^3 - 3Ad^2(1 + Bd^3)^2 \times 3Bd^2}{(1 + Bd^3)^6}$$

$$= \frac{Ad(2 - 7Bd^3)}{(1 + Bd^3)^4}$$

$= 0$ when $d = 0$ or $d^3 = \frac{2}{7B}$

It may be shown that $d^3 = \frac{2}{7B}$ gives a maximum

Now $$d^2 = \left[\frac{12\,W}{7\,Cg}\right]^{\frac{2}{3}}$$

$$\therefore \quad P_m = \frac{1}{2} \times \frac{Cv_0^2 \times 1.42 \left(\frac{W}{Cg}\right)^{\frac{2}{3}}}{1 + 2/7}$$

$$= 0.82\, v_0^2 \sqrt{\left(\frac{W}{g}\cot^2\alpha\right)^2 \rho \frac{L}{h}}$$

Similarly for a prism of length l, dropping into calm water

Equ. mass $= \frac{\pi}{2}\rho y^2 \cot^2\alpha\, l$.

$$\therefore \text{ momentum } M = \left(\frac{W}{g} + \frac{\pi}{2}\rho y^2 \cot^2\alpha\, l\right) v = \frac{W}{g} v_0$$

or $$\frac{dy}{d} = \frac{v_0}{1 + \frac{\pi\rho g \cot^2\alpha\, ly^2}{2W}}$$

put $C' = \pi\rho \cot^2\alpha\, l$

then $$\frac{dy}{dt} = \frac{v_0}{1 + \frac{1}{2}\frac{C'g}{W}y^2}$$

also $$\frac{d^2y}{dt^2} = -\frac{v_0^2}{\left(1 + \frac{1}{2}\frac{C'g}{W}y^2\right)^3} \times \frac{C'g}{W} y$$

$$\therefore \quad P' = -\frac{C'yv_0^2}{\left(1 + \frac{1}{2}\frac{C'g}{W}y^2\right)^3}$$

put $A' = C'v_0^2$

$B' = \frac{1}{2}\frac{C'g}{W}$

then $$\frac{dP}{dy} = \frac{A'(1 - 5B'y^2)}{(1 + B'y^2)^4}$$

$= 0$ when $A' = 0$ or $y^2 = \frac{1}{5}B$

hence $$P_m = 0.915\, v_0^2 \sqrt{\frac{W \cot^2\alpha\, \rho l}{5}}$$

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SUMMARIES OF A.R.C. REPORTS (Continued)

RELAXATION METHODS APPLIED TO A SPAR OF VARIABLE SECTION, DEFLECTED BY TRANSVERSE LOADING COMBINED WITH END THRUST OR TENSION. By R. J. Atkinson, B.E. (Queensland), K. N. E. Bradfield, B.Sc., B.E. (Sydney), and R. V. Southwell, F.R.S. R. & M. No. 1822. (33 pages and 5 diagrams.) September 10, 1937. Price 4s. 6d. net.

A recent paper[1] dealt with deflexions caused by transverse loading in a beam having any specified distribution of flexural rigidity. Corresponding methods are employed to solve (approximately) the much more difficult problems which are presented when end thrust operates in conjunction with transverse loading, e.g., in the spars of aeroplanes or in the stanchions of steel-framed buildings. As in relation to the simpler problem, an extension of the relaxation method seems to have advantages in respect of convenience over an alternative and more orthodox method based on the calculus of finite differences. Both methods yield results of more than sufficient accuracy for practical purposes.

A numerical example, treated in an appendix to the paper, illustrates the reduction of continuous beams (treated by the relaxation process) to problems involving a single span. A second appendix shows that the first of the methods here described can be applied to find critical loads for struts of non uniform cross-section.

[1] K. N. E. Bradfield and R. V. Southwell, Relaxation Methods Applied to Engineering Problems. I.—The Deflexion of Beams under Transverse Loading. *Proc. Roy. Soc. A.* Vol. 161, 1937, pp. 155–181.

GUST LOADS ON TAILS AND WINGS. By D. Williams, B.Sc., A.M.I.Mech.E., and J. Hanson, B.Sc., D.I.C. R. & M. No. 1823. (39 pages and 18 diagrams.) May 11, 1937. Price 5s. 6d. net.

The theoretical investigation of tail loads induced by gusts has received little attention in the past and no direct allowance is at present normally made for such loads in the course of aeroplane design. In this report the primary purpose has been to estimate the magnitude of such loads under various flying conditions the investigation of the accompanying wing loads fulfilling the secondary purpose of supplementing previous work.

Three types of gust have been considered—the abrupt, the sharply graded linear, and the gently graded linear and their tail and wing load effects have been determined for three aeroplanes of different stability characteristics in pitch the first being moderately stable, the second very stable and the third unstable.

The effect of varying the wing loading has been found and the changes in wing and tail loads caused by the change from a rigid to a flexible wing have been considered. No account is taken of the Wagner effect in the numerical work and the effect of the slipstream has also been excluded.

All results are expressed on a relative basis, the loads being given as a fraction of the maximum loads which would be induced if the aeroplane maintained without pitch or wing flexure a straight horizontal course. For convenience this fraction will be referred to as the "load-ratio."

The results obtained in the case of rigid wings indicate that in no circumstance is the aerodynamic load-ratio on the wing likely to exceed a value of 1.1. The effect of inertia loads on the resultant tail load is considerable—about 25 per cent. on the average—depending of course upon the ratio between tail plane mass and total mass. Wing flexibility is important if the time taken for the gust to build up its maximum value is short compared with the natural vibration period of the wing.

The maximum tail load is not so sensitive to changes in wing flexibility as the wing load, and in the cases considered it was little affected, so that the conclusion in regard to the greatest values of tail loads given above for the case of rigid wings holds also for flexible wings.

FLIGHT TESTS ON THE PROFILE DRAG OF 14 PER CENT. AND 25 PER CENT. THICK WINGS. By J. E. Serby, B.A., M. B. Morgan, B.A., and E. R. Cooper, M.Sc., Ph.D. R. & M. No. 1826. (16 pages and 22 diagrams.) November 17, 1937. Price 3s. 6d. net.

It has become increasingly important in recent years to know how rapidly the profile drag of a wing increases as the thickness/chord ratio is increased. It is important to designers who wish to retract undercarriages into the wings and house engines and bombs in them. A given increase in profile drag, which could perhaps have been allowed at the time when aeroplane drags were high, may now be too large to be tolerated when aeroplane total drag coefficients (less induced drag coefficient) are as low as 0.020 (C_{D_0}).

Wind tunnel measurements of minimum profile drag are liable to error if the turbulence of the tunnel air-stream is high, and the flight tests described here were designed to give results free from this doubt.

Using the momentum method the profile drags of two smooth wing sections, both with R.A.F. 28 centre line, one 14 per cent. thick, the other 25 per cent. thick have been measured over a range of Reynolds number 5.7×10^6 to 8×10^6. The boundary layer transition points were also located. The drag results are compared with calculated values.

With ideally smooth surfaces transition points as far back as 0.36c are possible and the resultant drags are low, viz. 0.0065 and 0.0080 for 14 per cent. and 25 per cent. thick wings. It is estimated that if the transition points moved forward to 0.15, as is likely in practice these drags would rise to 0.0078 and 0.0108.

COMMERCIAL AVIATION

SWEDISH CENTRE: The new administrative building at the Torslanda sea and land airport at Gothenburg. The arrangement of the control room is reminiscent of that at Bromma, Stockholm, and has very definite advantages. The aerodrome at Gothenburg has been very considerably extended during the last year and further extensions are planned for the near future. Torslanda is considered in Sweden to be the country's most important air centre.

THE WEEK AT CROYDON

"A. Viator" Views the International Situation at London's Terminal and Discusses the Long-considered Reserve Airport Scheme.

THIS is the season of mists and mellow fruitfulness which is by no means to be confused with the overlapping season of fists and yellow frightfulness of the political calendar. With autumnal fogs and sere and yellow QBI conditions, we of the air transport fraternity are deeply concerned—especially with fairly obvious ways of avoiding delays, danger and difficulties, which latter would be obviated by adequately equipped alternative airports to supplement Croydon and Heston.

There are those in authority whose declared job it is to look after this important side of our business on our behalf, and it is disconcerting to see in their schemes a mellow fruitfulness more akin to the ripeness of the medlar than of the sound and wholesome apple.

Let me quote from that authoritative source, *The Report on the Progress of Civil Aviation in 1935*, where, under the heading "Provision of Relief Aerodromes in the London-Continent Airway Area," the following remark appears: "As long ago as 1933 it became evident that additional aerodromes were required in the London-Continent airway area to afford relief to the main airport at Croydon on occasions when that aerodrome was affected by bad visibility." It also said: "It was clear that at least one large subsidiary aerodrome outside the fog belt was required to cater for German and Netherlands aircraft entering the country via the Thames Estuary, and another for aircraft arriving from Paris via Bexhill."

If the establishment of proper relief airports—Gatwick and Gravesend were mentioned in the report—was essential in 1933, how much more vital is the need to-day, when three or four more companies are on these routes, Swissair, for example, with Swedish, Danish and Czechoslovakian air lines—and when all companies have trebled and quadrupled their traffic and, in many cases, their services also.

The two terminals, Croydon and Heston, are hopelessly overloaded with traffic during QBI and a fast machine capable of making the journey in little more than an hour from terminal to terminal in favourable conditions may have to wait for a solid hour before the pilot is given his permission to come in. During that period he could put down at a properly equipped alternative airport and his passengers could be in London as quickly as they now are after an hour's alarmed hanging around the skies.

Gatwick, for example, once had a Lorenz blind approach beacon, but this was removed with the consent of the authorities; and Gravesend has been allowed to languish from the commercial point of view.

It must, nevertheless, be clear to the meanest intelligence, as well as to the authorities concerned, that an emergency aerodrome to be used in bad weather must be at least as well equipped as the terminus. Anxiety, unnecessary risk, and the cancellation of services which would otherwise start, are natural results of the swift and agile way in which the Air Ministry has tackled a problem which, they say, was clear to them in 1933.

It is amusing to note that *The Progress of Civil Aviation* (downhill, backwards and in reverse, in this particular respect) for 1937 eschews all mention of "relief aerodromes in the London-Continent airway area," but there is a jolly chapter on gliding, and the following delightful piece appears: "At Croydon an appreciable increase in traffic in 1937 over 1936 necessitated minor internal alterations to the administrative buildings." Thank goodness something was done to cope with the appreciable increase of air traffic.

Maritime Tragedy

I have before me a newspaper cutting concerned with commercial aviation entitled "Poor Fish: They Died of Red Tape," which I *do* hope you won't think is anything to do with the sufferings of air transport people under a doubtless well-meaning Ministry.

Far from it, for it recounts how certain tropical fish, which have to be kept at a fairly high temperature, died of cold, boredom and senile decay at an airport (other than Croydon or Heston) because some document was not in order. This was a question between the Customs, no doubt, and the Ministry of Agriculture and Fisheries. Fisheries was away for the week-end, I imagine, and it was not Agriculture's province.

Things move so quickly these days that Bad Godesberg may have been renamed Good Eggfort or even Wurst Wangleheim before this gets into print.

Quite a lot of rush traffic to and from Prague came to the various air lines, and one of the best efforts was by good old *Heracles*, which set out at the crack of dawn one day for Budapest with bullion pushing her hatches

COMMERCIAL AVIATION (CONTINUED)

up. All for a spot of excitement, *Heracles* then nipped across to Prague and returned, slowly but surely, to Croydon, via Cologne, with a load of ladies from the British colony there. How they must have welcomed the dignified and solid aeroplane flying the British ensign.

Olley Air Service had the job of bringing a scarlet fever patient from Prague, too, much to the delight of the crew. Volunteers were called for, I understand, but only one luckless wireless operator had a German visa—so he volunteered.

One of the companies had urgent need, for a special job, of the crew of a machine which was not due to go back until the following morning. The manager of a local cinema was 'phoned, and kindly put the request on the screen. The crew was back at the airport in half an hour, and they are still wondering if the heroine escaped from the villain's clutches.

At Croydon the political thermometer could be fairly accurately gauged last week by observing what happened to the Czechoslovakian machines. Up to Friday night C.L.S. operated as usual between Prague and London, flying, of course, over German territory. On Saturday morning the Czech pilot and crew were under the orders of the Czech Legation in London and the mid-day service was cancelled. Late Saturday evening the C.L.S. machine flew to Rotterdam to await further orders, and on Sunday morning permission was obtained to fly over German territory to Prague.

On Saturday, too, other services to Prague—K.L.M., for example—and Sabena were cancelled, but by Monday they were running again as usual.

Sunday brought Gen. Gamelin to Croydon, to be met by Mr. Hore-Belisha, and on Saturday evening M. Daladier and M. Bonnet arrived. They were welcomed by a huge banner, "Welcome Our Allies," spread by certain enthusiasts from one end of the terminal building roof to the other and by a certain amount of assorted flag wagging, the nationalities of the flags being left for you to guess. Another portent was the departure of Mr. Winston Churchill for Paris in a startlingly characteristic hat, complete with cigar and wearing the well-known astrakhan-collared coat. Mr. Churchill, fighting his way through reporters and cameramen, remarked that he was travelling incognito. An admirer is said to have sent him an auburn false beard which, in conjunction with a perfectly normal hat, will form, it is thought, a good disguise—especially if a Baldwin-type pipe is substituted for the cigar.

A. VIATOR.

Second Crossing

FOLLOWING its recent out-and-home flight to the United States, the French seaplane *Lieutenant de Vaisseau Paris* left its base at Biscarosse, near Bordeaux, for Lisbon on Friday of last week for a second North Atlantic crossing. The same route, via the Azores, is being used.

Flares at Southampton

WITH the shortening of the days it is now necessary for the Empire boats on the Australia and South Africa services to leave Southampton before dawn. The Imperial Airways system of flare-buoys was laid out last Saturday for the first of these pre-dawn take-offs when *Canopus* and *Corinthian* left on the Singapore and Durban services respectively.

On the Empire routes the majority of these flare-buoys are fed by paraffin and the lamp unit is, in each case, put on the buoys, which are first towed out to position. In Southampton Water the flares are, in fact, electrically fed from batteries in the floats and the two bulbs are amber-coloured so that they will not be confused with the ordinary shipping navigation lights. Launches are stationed at each end of the path, and after the take-off these remain out until there is no further possibility that the flying-boat or boats will be returning owing to some possible mechanical trouble. In due course the buoys are hauled into the launches and taken ashore.

Winter, Too

THE Portsmouth, Southsea and Isle of Wight Aviation Co. will, for the first time, operate a winter service this year between Southampton and Ryde. During the past summer they have carried nearly 4,000 passengers on their various services.

More 338s for Air France

THE Dewoitine 338—which is the type used on Air France's Toulouse-Casablanca-Dakar service, and also on the eastward line from Damascus to Saigon and Hong Kong—has become the dominant Air France type as the result of an order, just placed, for eight further machines. The company will have, altogether, twenty-eight of these machines.

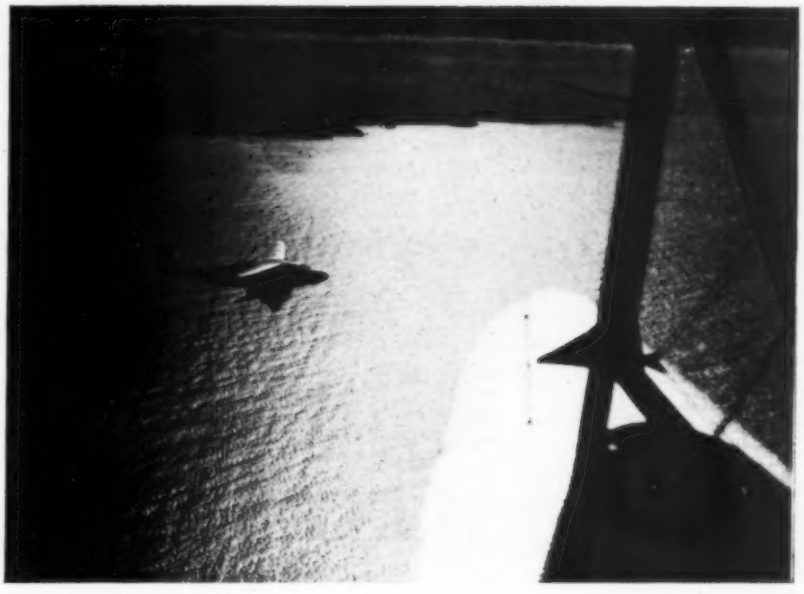
The most recent order was given to take the place of the forty-seater Farman 224s, five of which were surrendered to the Government for Air Force use.

The Dewoitine 338 is powered by three Hispano-Suiza 9 V engines of 650 h.p. each, and has a cruising speed of 162 m.p.h. The fleet of twenty-eight will be split up among the various lines of Air France, those used on the Continental route being fitted to carry twenty-two passengers, those on the Toulouse-Casablanca-Dakar route eight passengers as well as the South American mail, and those on the Eastern route a minimum of four passengers in sleeping bunks with a non-stop range of about 1,500 miles.

ON TEST AGAIN: The Boeing 314 Atlantic boat flying over Seattle on test with its new twin-rudder tail assembly and modified sponsons. In this case she was loaded up to a gross weight of 77,500 lb., which is stated to be the greatest ever to be airborne over America. Included in the weight was the test pilot, Edmund T. Allen, with a crew of five assistants and test engineers.

3,000,000 MILES IN N.Z.

The Dominion's Airlines and Their Equipment : A Fine Safety Record



A Union Airways D.H.86 on the daily Palmerston-Blenheim-Christchurch-Dunedin run.

OVER 20,000 passengers a year now pass through Rongotai, the airport which serves Wellington, New Zealand's capital city. Some 20 per cent. of the Wellington-Marlborough passenger traffic across the Cook Strait, which separates the two main islands, is now air-borne. The Wellington-Blenheim journey of nearly four hours by boat and train is cut to half an hour, while passengers to Nelson avoid an all-night and frequently rough steamer crossing. The two-day, 750-mile journey from Auckland in the north of North Island to Dunedin in the south of South Island has been reduced to seven hours.

In 1937 the N.Z. airways carried 38,210 passengers, 185,733 lb. of mail, and 69,299 lb. of freight. The distance flown totalled 1¼ million miles. In two years passenger traffic has increased by 900 per cent., and mail by 1,250 per cent.

Actually, the 1,700 route-miles of scheduled air services have been built up in three to four years. Development started with essentially economical aircraft, and the size and commercial geography of the Dominion suggest that such machines will continue to be most suitable for several sections of the system, while the main business routes are now beginning to call for faster craft.

The first scheduled airline was inaugurated in December, 1934, with a Fox Moth operated by a pioneer pilot, Capt. J. C. Mercer, who had opened up the Westland coast and Southern Alps to aviation, using a landing ground at Hokitika and one at Waiho Gorge by the Franz Josef Glacier, as well as sea beaches and river beds where he could put down. His Fox Moths now carry mixed loads on a weekly service between Hokitika, Weheka, Haast and Okuru, linking isolated communities strung over a hundred miles of cattle-farming country with poor roads and no railway at all.

Air Travel (N.Z.), Ltd., Capt. Mercer's company, has three D.H. Fox Moths and a Dragonfly, and has just acquired a second Dragonfly. A thrice-weekly service operated with the latter machines connects Inchbonnie, a rail station just the west side of the Alps, with Hokitika, and takes tourists south to the glaciers Charter trips take Air Travel almost every-

(Left) Capt. J. C. Mercer, who pioneered airline work in New Zealand; his company is Air Travel (N.Z.) Ltd. (Right) Some well-known pilots on the Dominion's airlines (left to right): Cdr. S. Gilkison, Cook Strait Airways; 2nd Officer G. Harvey and Cdr. A. G. Gerrand, service manager and chief pilot of Union Airways; and 2nd Officer W. G. C. Allison and Cdr. R. A. Kirkup of Union Airways

Commercial Aviation

Air Travel are still receiving faithful service from their Fox Moths. The one seen here is about to load whitebait caught in the rivers of Westland.

where in both islands. In 1937 the company carried on its regular service 879 passengers, 58,913 lb. of mail, and 19,367 lb. of freight with regularity of 94.7 per cent.

In April, 1935, East Coast Airways connected two busy sheep-district ports, Gisborne and Napier, using D.H. Dragons for the crossing of Hawke Bay. In October, 1937, an extension was opened to the Union Airways mainline at Palmerston North. The two concerns are now associated and the Union D.H.86s run through to Gisborne. In 1937, traffic was 5,249 passengers, 6,430 lb. of mail, 1,314 lb. of freight, and a regularity of 99.4 per cent.

Probably best known by name to people in this country are Cook Strait Airways and Union Airways. The former, with their base at Nelson, inaugurated the over-water link to Wellington and Blenheim with three D.H.89s on December 29, 1935. In the first three months they carried 3,000 passengers; in 1937 they carried 19,235, as well as 33,205 lb. of mail and 34,745 lb. of freight. Passengers in Jan.-Mar., 1938, numbered 6,508. Two more D.H.89s have since been purchased. Cook Strait co-operate closely with Union Airways and the former's ferry connects daily with the Union mail line at Blenheim. There are also 14 services a day for general traffic. Despite erratic local weather, regularity is now about 95 per cent. On February 23, 1937, when Hokitika Aerodrome was suitable, a thrice-weekly extension was opened to connect with Air Travel (N.Z.), Ltd.

On January 15, 1936, Union Airways started the daily two-way 495-mile trunk service between Palmerston North, Blenheim, Christchurch, and Dunedin. Using three D.H.86s, they carried 1,212 passengers up to the end of March, 1936, with 100 per cent. regularity. Always heavily in demand by business people, this line progressed steadily, and an extension service to and from Auckland, obviously necessary, was started on June 27, 1937, using three Lockheed Electras. In 1937 Union Airways carried 12,847 passengers, 89,185 lb. of mail, and 13,873 lb. freight, with regularity of 99.8 per cent.

New Zealand has a notable safety record. No passenger on a scheduled air service has been injured in over three million miles of flying, and there has been a remarkable freedom from mechanical trouble. Latest aggregate figures to hand covering air-lines and charter flying are for twelve months to March 31, 1938: 1,501,345 miles flown in 13,024 hours; 51,556 passengers; 216,238 lb. mail, 91,703 lb. freight. Clubs flew 19,295 hrs. in the same period, and in March had 19 instructors, 16 licensed engineers, and 58 aircraft—nearly all Gipsy-engined, mostly Moths and Tiger Moths. The commercial companies had 25 pilots, 9 co-pilots, 29 licensed engineers, and 15 aircraft (12 of D.H. make). The Dominion had 546 pilots' "A" licences, 74 "B" licences, 68 engineers' licences, 74 valid aircraft C.s of A., and 51 public aerodromes; this year's budget estimates provide £1½ million for development of aerodromes, radio, etc. Ten W/T. stations were working, eight D/F stations were being erected, and three more were planned, as well as several radio approach beacons.

Useful Again

ON his second visit to Herr Hitler, made on Thursday of last week, Mr. Chamberlain travelled from Heston to Cologne in British Airways' Lockeed 14—the machine which had flown to Stockholm and back, non-stop each way, the previous Sunday.

The Fourteen was flown by Cdr. E. G. L. Robinson (who had handled it on the Stockholm flight), with Cdr. D. F. King as second pilot. The return journey with the Prime Minister was made on Saturday of last week, and a speed of 190 m.p.h. was averaged.

Thus the Prime Minister, who had never flown previous to his first visit to Herr Hitler, is already a comparatively seasoned air traveller. It may be assumed that, in happier future times, he will remain an enthusiastic user of this fast and convenient method of transport.

Winter in Scotland

THE Scottish Airways summer schedules terminate next Saturday, and thereafter single daily services, Sundays excepted, will be run between Glasgow, Campbelltown and Islay, with twice-weekly return services between Glasgow, Tiree, Barra, South Uist, Benbecula and North Uist, and between Glasgow and North Uist. Additionally, there will be week-day services between Inverness, Wick, Kirkwall; four times weekly services between Kirkwall and the Shetlands; and "on demand" services between Kirkwall and the North Isles. The Glasgow-Perth and Inverness service, as well as the Aberdeen connections, have been suspended for the winter season.

The fact that Air Ministry officials have recently been inspecting landing grounds in the Outer Hebrides suggests that extensions are to be made to many of these following the steady increase in air travel between Glasgow and such places as Barra and North Uist. It is known that the landing ground at Askernish, South Uist, is to be considerably extended, and it is probable that larger machines will be put into service next summer. During the official tour the new aerodrome at Tiree was examined, as well as the field at Glenbrittle, Skye.

Empire Extensions

LAST week Palestine Airways opened a new regular branch of the Imperial service to India. The new service will be operated daily between Lydda, the airport for Jerusalem, Tel Aviv and Haifa, while a three-times-weekly service will be run on to Beirut.

Not only does this new service link up centres of growing importance in North Palestine, but it will provide, in the Beirut extension, a direct line between France and the French mandated territory of Syria. Palestine Airways, incidentally, work in co-operation with and are technically advised by Imperial Airways.

Early next month another of Imperial Airways' associated companies, Wilson Airways, will open a new service from Dar-es-Salaam to Dodoma, Tanganyika, a distance of 240 miles. Altogether the extensions involve an increase of 400 miles to the length of the Imperial network of air services.

COMMERCIAL AVIATION (CONTINUED) : WORLD NEWS

Rhodesian Charter

TWO new companies recently started charter operations in the Rhodesias. These are British Air Transport Services (Rhod.), Ltd., and Flights, Ltd.

The B.A.T.S. fleet at present consists of a Hornet and a Waco at Ndola and Nkana, respectively, with another Hornet and a Waco at Salisbury. Flights have a Vega Gull at Bulawayo and a Dragonfly at Salisbury. This company will also carry out servicing and overhaul.

Incidentally, the landing area at Ndola has been increased to allow for the transfer of Northern Rhodesia's terminal from Lusaka. A radio beacon is to be installed and hangars built, and the mails are expected to be flown to this town before the end of the year.

Trans-Canada

TRANS-CANADA AIRLINES will begin operations between Montreal and Vancouver some time between October 1 and the end of the year, according to an announcement made in Toronto by Philip G. Johnson, vice-president and general manager of the Canadian-government-owned airway.

The Winnipeg-Vancouver section is already in regular scheduled operation, with about 500 lb. of mail being carried daily. The western section is being flown at an average of about 5½ hours each way.

According to Mr. Johnson, Trans-Canada Airlines have flown more than 1,000,000 miles since July 1, 1937, and have trained 20 first-class pilots and 20 second-class or co-pilots for transcontinental service. Stewardesses will be employed by the line when it begins to carry passengers by the end of the year.

An Indian Enquiry?

THE Government of India, it is reported, have been requested to institute an enquiry into the affairs of Indian civil aviation and it is likely they will shortly appoint a committee for the purpose.

An important question that will come up before the committee is the new contract with the British company operating the India sector of the Empire mail route. When Imperial Airways were given the contract to fly across India and the Indian Trans-Continental Airways was formed, an agreement was concluded with the companies that a certain number of commercial and flying personnel should be Indians.

While (writes an Indian correspondent) a certain number of Indian officers have been recruited in the traffic land establishment, there has been no Indian pilot flying on this route as a regular officer until very recently, and even now there is reported to be no Indian as a senior pilot in charge of any aircraft. Indian aviation circles are not prepared to accept the explanation that there are no suitable technically trained men to take up such responsibilities, as they point out the creditable records of the Tata company pilots, and other individual pilots bear eloquent testimony to the efficiency and sense of responsibility evinced by them.

More and More

LAST Sunday the bookings on the India-Australia route were so heavy that both the normal service machines and the reserve were filled, and next Sunday this service is again being duplicated. Altogether eight services have already been duplicated this year and bookings are still increasing. Additionally it has been found necessary to add a third service in each direction on the Singapore-Sydney section of the Australia route, whereas the original scheme called only for two.

Much the same conditions are apparent on the African route. The Kisumu-Nairobi frequency has been increased to thrice weekly, the Kisumu to Lusaka frequency to two, the Beira-Salisbury frequency from two to five, the Beira-Lusaka frequency to three, the Johannesburg-Salisbury frequency from one to six, and the Johannesburg-Lusaka frequency from one to three. "All-up" conditions apply to the new mail service which is now being run between Kisumu and Geita, while the services from Lagos to Accra and from Bathurst to Freetown are now in regular operation, though they were not listed in the 1937 scheme. In the Far East a third two-way service has been added to those already operating between Bangkok and Hong Kong.

Although Imperial Airways have twenty-five machines nearing completion, and have given orders for six considerably larger machines, if this sort of thing goes on it is evident that preparations for even greater expansion must be made very soon.

Madagascan Progress

ORIGINALLY established to connect Madagascar with Europe, a company known as Service de la Navigation Aerienne de Madagascar was formed in July, 1934, which, using first small and then rather larger and more useful machines, ran a satisfactory service between Elisabethville (connecting with the Europe-Congo service) and Antananarivo.

Last year, in September, the name of the company was changed to Service de l'Aeronautique Civile (S.A.C.), and the Madagascan service was considerably augmented and connections established to Mozambique, Tete, Quelimane, and Tulear Morondava.

Making Use of Them

OPERATIONAL figures which have been tabulated for American air services up to July 1 this year show the really remarkable flying times put in by the various Douglas machines in the different operators' fleets.

There are 102 D.C.3s now in service in the United States, and of these eighty-six have completed 1,000 flying hours, while eight have completed 5,000 hours and three as much as 6,000 hours. Of the fifty-six D.C.2s in service, eight have completed 9,000 flying hours and fifteen have completed 8,000 flying hours; all of them have done more than 2,500 hours.

Actually, most of the D.C.3s fly about 8½ hours per day each, and the average over the whole number in service is 6¼ hours a day. One company, which uses eight D.C.2s with a life of more than 9,000 hours each, is flying its own in service at the rate of ten hours a day, while the figure, including those which are being overhauled and in reserve, averages out at 7¾ flying hours per day per machine. On August 1 one D.C.2 had actually put in 9,429 hours flying. In the figures given for the D.C.3s the eight which have flown more than 5,000 hours are all operated by one company, and at this figure the machines were dismantled, after which they were officially approved for an extension of the normal inspection and overhaul period.

Mobile Maintenance

WITH the steadily increasing size of transport and civil machines the problems involved in their maintenance or repair when away from the larger operational centres becomes a very difficult one. Additionally, there are times when emergency aerodrome lighting equipment, as well as two-way radio apparatus, may be necessary in mobile form.

Course Laboratories, of East Orange, N.J., U.S.A., have, during the last two years, been developing what they call their "Mobile Airport," and the final model is now in production. This affair naturally requires very complex and extensive equipment, and the difficulty has been to incorporate this equipment in a unit which is transportable by ordinary means and over ordinary and extraordinary highways.

The mobile workshop has been designed as a vehicle which can cope with terrain such as that which might have to be crossed on the way to an emergency field, and yet, at the same time, it can travel on a normal road at an average maximum of 45 m.p.h.

Naturally enough, every cubic foot of space in this truck, if so it can be called, is occupied, yet all unnecessary weight (in view of the conditions with which it would often have to deal) has been eliminated. The welded steel "floor" chassis is mounted on ten steel pneumatic-tyred wheels, while two spares are carried forward and serve either as a bumper, as tail jack for an aeroplane, or, in exceptional conditions, as additional support for the vehicle itself. Special treads for the rear wheels are also carried. The weight of the entire vehicle is less than 12 tons, and it is driven by a standard 85 h.p. Ford engine, which is removable as a unit.

A steel roof is permanently mounted, but hinged to it are two corrugated steel shields for shelter when work is being done. Hinged to the chassis floor are four steel-edged workbenches which may be removed and set up separately if necessary. The space aft of the driving compartment is divided into three parts comprising a lathe workshop, a section for compressor plant and portable tools, and a rear platform.

In the driving section there is a petrol-driven generator for use when the main motor generator is not operating, a seven-ton hydraulic jack and all the necessary engine and tyre repair tools. Additionally there is two-way radio apparatus with the testing equipment and tools, as well as special office equipment. Apart from the portable floodlights for carrying on work overnight, there are twelve electric floodlights and portable marker lights to make up the temporary airport lighting equipment.

SERVICE AVIATION

Royal Air Force and Official Announcements : Fleet Air Arm News : Military Aviation Abroad

Air Defence Measures

ON Monday last the War Office called up the officers and men of the anti-aircraft units and also of the coast defence units of the Territorial Army, while the Air Ministry called up the officers and men of the fighter squadrons and balloon barrage squadrons of the Auxiliary Air Force and of the Observer Corps. Officers and men of the regular Royal Air Force were also recalled from leave. These measures did not apply to the bomber and Army co-operation squadrons of the Auxiliary Air Force.

Higher Appointment

THE Air Ministry announces the appointment of Air Comdre. Charles Dempster Breese, C.B., A.F.C., to be Air Officer Commanding the newly formed No. 18 (Reconnaissance) Group, Royal Air Force, forthwith.

Air Comdre. C. D. Breese, born in 1889, was commissioned in the Royal Navy in 1909 as an Engineer Sub-Lieutenant and joined the R.N.A.S. in July, 1914. During the Great War he served in France, where he was wounded in an aerial combat in May, 1917, and, for his distinguished service, was awarded the Air Force Cross in 1918.

He was appointed to a permanent commission as a Wing Commander in the Royal Air Force in 1919, when he assumed command of the Central Flying School at Upavon. He proceeded to India in April, 1920, and was in command of the Aircraft Depot there from March the following year until January, 1924, when he was transferred to the Home Establishment. After holding an appointment at No. 1 School of Technical Training, Halton, and being in command at the Base at Gosport, he was posted in April, 1930, to Headquarters, Iraq, for Engineer Staff Duties, and was awarded the C.B. for services in connection with the operations in Northern Kurdistan, 1931-32. On his return to this country in 1932, he was appointed Senior Air Staff Officer at Headquarters, Fighting Area, and, the following year, proceeded to Headquarters, Inland Area, to take up a similar post. In July, 1934, he was appointed Air Officer Commanding, No. 23 (Training) Group, and since March, 1937, has been in command of No. 17 (Training) Group.

He was promoted to Group Captain in 1928, and to his present rank in July, 1932.

New Stations, Units, Etc.

THE R.A.F. Station, Detling, near Maidstone, opened on September 14, on which date it was placed in the Bomber Command in No. 6 (Auxiliary) Group No. 500 (County of Kent) (Bomber) Squadron will move from Manston to Detling on October 3. No aerodrome facilities will be available at Detling until after the arrival of No. 500 Squadron.

No. 25 Maintenance Unit formed at Hartlebury, near Kidderminster, with effect from September 1, on which date the unit was placed in the Maintenance Command.

The name of the Royal Airship Works, Cardington, will be changed forthwith to "Balloon Development Establishment."

No. 2 Air Observers' School will form at Acklington on November 15, on which date it will be placed in the Training Command in No. 25 (Armament) Group. The school will move to Pembrey (Carmarthenshire) in the summer of 1939 and Acklington will then resume its function as No. 7 Armament Training Station.

Class "E" Reserve

IN consequence of the expansion of the Royal Air Force it has been decided to increase the strength of the airmen's section of the Reserve of the Royal Air Force (known as Class "E") by the direct enlistment of personnel with Service experience.

Ex-airmen of all trades and ranks are, accordingly, invited to forward their present addresses immediately to the Officer i/c Records, Royal Air Force, Ruislip, Middlesex, with a view to the despatch of full information concerning the easy conditions which have been approved for membership of this reserve. It is estimated that the number of ex-airmen with either war or post-war experience is in the region of a quarter of a million.

The period of Service is four years. A bounty of £10 will be paid on attestation, a further £5 on completion of twelve months' reserve service and thereafter £5 each six months.

Volunteers will be medically examined and trade tested at the nearest R.A.F. station before engagement, but they are not required to undertake compulsory training. They will be called upon for service only in cases of imminent national danger or great emergency and, up to the rank of sergeant, will be given the rank that they previously held in the Royal Air Force.

Reservists may, however, volunteer to undertake trade training and in such cases arrangements have been made for them to have two short training periods during their four years' engagement. These reservists will receive an additional bounty of £5 for each period of training and the appropriate rates of pay and allowances while undergoing instruction. This scheme does not apply to pensioners or to ex-airmen in civilian employment in the Royal Air Force or Air Ministry .

"*Flight*" *photograph.*

TRAINING THE TRAINER : Mr. H. W. C. Skinner, Philips and Powis test pilot, takes a turn with the Magister, now modified by the fitting of a rudder of higher aspect ratio.

No. 4 (A.C.) Squadron Dinner

NO. 4 (Army Co-operation) Squadron held a reunion dinner at Grosvenor House, London, hotel last Friday to celebrate its twenty-fifth birthday. A large number of former officers of the squadron was present, including Air Marshal Sir William Mitchell, A.V-M. Sir Charles Longcroft, and A.V-M. Playfair. Sqn. Ldr. (Major, R.A.) I. O'B. MacGregor was in the chair.

The only toasts drunk were "The King" and "No. 4 Squadron," and the speeches were short. The gathering, however, recalled the stirring days of August, 1914, when the four original squadrons of the R.F.C. flew to France to begin four years of warfare, and the many gallant deeds performed by the squadron in its R.E.8 machines. Then, as now, the work of the squadron was reconnaissance for the Army. The various speakers specially recalled the work of the wireless flight of the squadron organised by Lts. Lewis and James, which was the beginning of all the wireless development in the Air Force.

The Edmonton Accident

THE Air Ministry have now considered the evidence in connection with the accident which occurred at Edmonton on September 4.

The circumstances of the accident, it is stated, are found to have been as follows: The pilot was instructed to practise taking off, landing, and climbing turns in the vicinity of Hatfield aerodrome. Contrary to instructions, which forbid pupils to proceed more than three miles from the aerodrome without special permis-

SERVICE AVIATION (CONTINUED)

sion, he flew direct to Edmonton, a distance of about 13 miles. There he appears to have put the aircraft into a dive with throttled engine from about 1,000ft. The carrying out of this manœuvre at such a height was also contrary to regulations. He flattened out of this dive and continued on the level for some distance at a low height. It would then seem that he allowed the nose of the aircraft to fall and, losing height rapidly struck the roof of a house. In the absence of the pilot's evidence, the reason for the accident cannot be determined with absolute certainty, but it is considered that the primary cause of the accident was wilful disobedience to orders on the part of the pilot. There is no evidence to show that there was any defect in the engine or aircraft which would have caused the accident.

It is desirable to repeat (continues the Air Ministry) that stringent regulations exist designed to reduce to a minimum the risk of accidents involving the civil population arising out of flying by Service personnel in the course of training. These regulations provide that:—

(a) An aircraft should never fly below 2,000ft. except when taking off or landing or through stress of weather.
(b) When it is necessary in the course of cross-country flights to pass over towns and thickly populated areas they are to be crossed only at a height which would enable the aircraft to reach open country in the event of engine failure.
(c) If a pilot is forced to fly unduly low through stress of weather, he must enter full details in a book kept for this purpose at every aerodrome.
(d) Aerobatics are not permitted anywhere below 3,000ft., except on certain specially authorised occasions.

The Air Ministry is of opinion that these regulations are generally observed. Strong disciplinary action is taken against any offender against whom a breach of the regulations is brought home.

Extension of Service

THE undermentioned officers have been selected for extension of service to complete six years on the active list:—

F/O.s George Gerard Storey and Peter Fitzgerald Webster; P/O.s Geoffrey Lionel Corden Bagshaw, John Carleton Betts, Howard Peter Blatchford, Cecil Halford Bull, James Hugh Dundas Chapple, John Arthur Coltart, James Gillan, John Price Hopkins, John Evelyn Scoular, Denis Frank Spotswood, Philip Dennis James Strong.

Flying Accidents

THE Air Ministry regrets to announce the following accidents:—Corpl. Henry Edward West and A/C.1 James Stewart Gray lost their lives in an accident which occurred at Beamish, near Newcastle, to an aircraft of No. 61 (Bomber) Squadron, Hemswell, Lincoln. Corpl. West and A/C.1 Gray formed the crew of the aircraft, the pilot of which, P/O. A. G. Newton, was not injured.

P/O. Dennis Gerald Baker (pilot) lost his life and A.P/O. Harold Arthur Cooper Bird-Wilson was seriously injured in an accident which occurred near Digby to an aircraft of No. 4 Elementary and Reserve Flying Training School, on September 19.

Cpl. Ronald Narbett and Cpl. Cyril Henry Clayton are missing and believed to have lost their lives and A/C.1 William John Reed was seriously injured in an accident which occurred at Angle Bay, Milford Haven, on September 20, to an aircraft of No. 210 (General Reconnaissance) Squadron, Pembroke Dock, Pembrokeshire. The pilot of the aircraft, Sqn. Ldr. Archibald Martin Watts-Read and the following members of the crew were slightly injured: F/O. John MacLachlan Harvey Sinclair, P/O. Dennis Bowen Esmonde-White, L.A/C. George Wyndham Bowen. The remaining member of the crew, A/C.1 Hubert Allen Jenkins, was not injured.

Royal Air Force Gazette

Royal Air Force

General Duties Branch

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—C. L. Gomm, (Acting Flight Lieutenant) (August 7); R. E. Baxter, R. H. Spencer (Acting Flight Lieutenant (seniority June 3); G. S. A. Parnaby, R. C. Crawford, R. J. C. Nedwill, J. B. Black, J. Duncan (September 16).

The following Flying Officers are granted the acting rank of Flight Lieutenant on the dates stated:—G. E. Harrison (August 1); C. E. E. Florigny (August 13); R. W. G. Kitley (August 25).

Lt. D. D. O'Brien, R.N., Flight Lieutenant, R.A.F., ceases to be attached to the Royal Air Force on return to Naval duty (September 14).

The following Flight Lieutenants are placed on the retired list on account of ill-health on the dates stated:—H. H. Leech (September 17); H. G. Richards (September 20).

Medical Branch

The following Flight Lieutenants are granted permanent commissions in that rank (September 2):—L. N. Trethowan, M.R.C.S., L.R.C.P., J. B. Wallace, M.B., Ch.B.

Royal Air Force Reserve

Reserve of Air Force Officers

General Duties Branch

A. A. Rumsey is granted a commission as Flight Lieutenant in Class A (September 13); E. C. G. Badcock is granted a commission as Flight Lieutenant in Class C with effect from September 20 and with seniority of July 1, 1936.

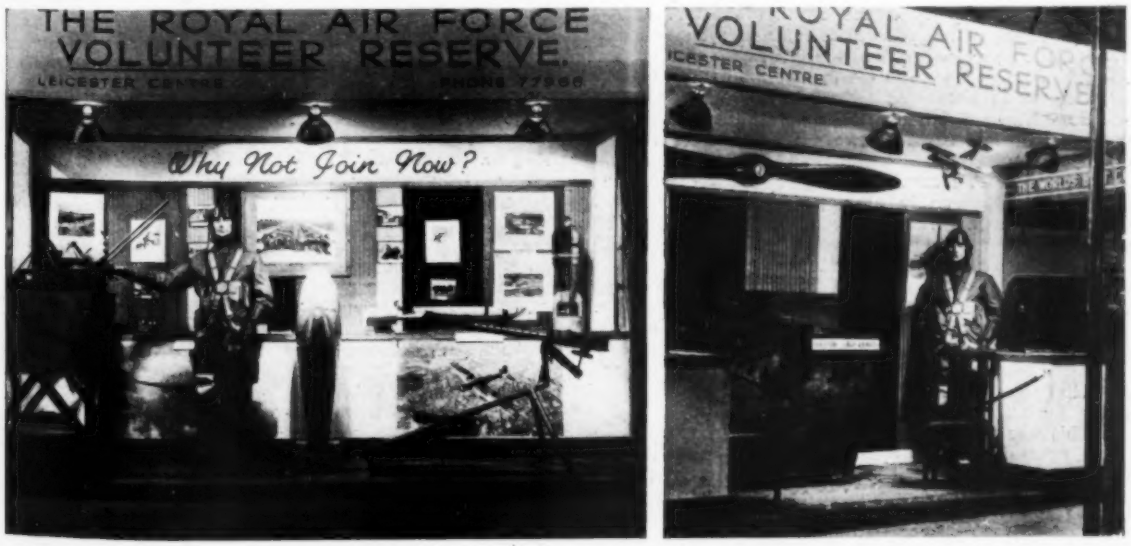
The following Flying Officers are promoted to the rank of Flight Lieutenant (September 5):—E. F. Wain, G. E. E. Singleton, L. W. Howard, P. H. Maxwell, A. H. Hole.

The following Flight Lieutenants relinquish their commissions on completion of service on the dates stated:—C. J. Lewin (August 2); C. A. Washer (August 27).

Auxiliary Air Force

Equipment Branch

Lt. W. H. G. Heath (R.A., retd.) is granted a commission as Flight Lieutenant (August 2).



ENTERPRISE : The Leicester H.Q. of the R.A.F.V.R. have organised these two recruiting stands at the "Home Life" Exhibition, Granby Halls, Leicester, in an effort to make good the number of Reservists transferred to the newly opened Nottingham centre. The display was arranged by Air Comdre. E. L. Gerrard, C.M.G., D.S.O., and Mrs. Gerrard, assisted on the stand (when time permits) by F/O. G. E. Lowdell and F/O. Watts from the Reid and Sigrist school at Desford. The exhibit includes one of the latter firm's pilot-reaction recorders.

Service Aviation

Royal Air Force Appointments

General Duties Branch

Air Vice Marshal.—J. T. Babington, C.B.E., D.S.O., to H.Q., R.A.F., Far East, Singapore; on appointment as Air Officer Commanding, 10.9.38.

Group Captains.—E. O. Grenfell, M.C., D.F.C., A.F.C., to R.A.F. Station, Gosport; to command, 1.9.38. B. E. Baker, D.S.O., M.C., A.F.C., to R.A.F. Station, Leuchars; to command, 1.9.38.

Wing Commanders.—A. G. Bishop, O.B.E., A.F.C., to Special Duty List; on appointment as Air Attaché, Bangkok, 30.8.38. E. F. Waring, D.F.C., A.F.C., to School of Air Navigation, Manston; for flying duties in the Training Squadron, 12.9.38. A. W. Franklyn, M.C., to No. 2 Air Armament School, Eastchurch; for Armament duties, 12.9.38.

Squadron Leaders.—R. F. Gandy, to No. 4 F.T.S., Abu Sueir, Egypt; for flying duties in the Advanced Training Squadron, 15.9.38. R. V. McIntyre, to No. 70 (Bomber Transport) Squadron, Habbaniya, Iraq; for flying duties, 27.8.38. C. R. Ashton, to No. 2 F.T.S., Brize Norton; for Administrative duties, 12.9.38. W. P. J. Thomson, to Recruits Sub-Depot, Scampton; to command, 12.9.38.

Flight Lieutenants.—A. H. Allen, to No. 902 (County of London) (Balloon) Squadron, Kidbrooke, 1.9.38. J. C. Bevan, to Electrical and Wireless School, Cranwell, 31.8.38. G. H. O. Mills, to H.Q., R.A.F., Palestine and Transjordan, Jerusalem, 8.9.38. D. M. H. Craven, W. D. Disbrey, D. F. Dixon, A. D. Groom, G. W. Peel, L. Rose, D. W. Williams and R. G. Yaxley, M.C., to Home Aircraft Depot, Henlow, 28.8.38. C. T. Weir, I. D. Jackson, P. Haynes, H. R. Coventry, and E. M. T. Howell, to No. 1 Air Armament School, Manby, 28.8.38.

Equipment Branch

Squadron Leaders.—E. N. D. Worsley, to R.A.F. Station, Gosport; for Equipment duties, 26.8.38. C. B. Horsfield, to Directorate of Equipment, Air Ministry, *vice* Wing Cdr. H. E. Tansley, M.C., 12.9.38.

Accountant Branch

Wing Commander.—F. W. Arthurton, to R.A.F. Station, Gosport; for Accountant duties, 12.9.38.

Flight Lieutenant.—J. E. Gregson, to R.A.F. Station, Leuchars, 1.9.38.

Medical Branch

Flight Lieutenant.—W. P. Stamm, to R.A.F. Institute of Pathology and Tropical Medicine, Halton, 8.9.38.

Chaplains Branch

Rev. O. R. I. Jones, to R.A.F. Station, Amman, Transjordan; for duty as Chaplain (C. of E.), 24.8.38. Rev. D. C. E. Rogers, to No. 1 Air Armament School, Manby; for duty as Chaplain (C. of E.), 6.9.38. Rev. C. S. J. Haskins, to R.A.F. Station, Cosford; for duty as Chaplain (Methodist), 17.8.38. Rev. V. S. Dodson, to R.A.F. Station, St. Athan; for duty as Chaplain (C. of E.), 8.9.38. Rev. J. Done, to R.A.F. Station, Cosford; for duty as Chaplain (R.C.), 21.8.38. Rev. G. W. N. Groves, to R.A.F. Station, St. Athan; for duty as Chaplain (C. of E.), 8.9.38.

Owing to the greatly increased length of these lists, as a result of R.A.F. expansion, ranks are confined to those of Flight Lieutenant and above.

EDINBURGH-NORTHOLT at 409 m.p.h.

Sqn. Ldr. Gillan's Own Impressions

A GRAPHIC account of the flight last February from Turnhouse (Edinburgh) to Northolt in 48 minutes ground to ground in a Hawker Hurricane is given in the *Journal of the Royal Air Force College* autumn issue, the author being the actual pilot, Sqn. Ldr. J. W. Gillan, C.O. of No. 111 (Fighter Squadron). We reproduce the following extract with full acknowledgments to our Cranwell contemporary. Sqn. Ldr. Gillan writes:—

"I was slumbering in the ante-room after lunch—a pleasant custom I had learned in the East; it was a bitter day, a gale was blowing, and the clouds were at 500 feet. All our aeroplanes were in the hangars and there appeared no prospect of our being disturbed; all our paper work was complete, and I had heard that the telephone system in the Camp had broken down. There were lots of coal on the fire and I remember wondering in my sleep whether it was not one of those days when one smoked one of the fast diminishing supply of cigars one had received as Christmas presents, when I was rudely awakened and shown a paragraph in a technical paper: 'Hurricane Flies from Edinburgh in Sixty-five Minutes.'

"The afternoon was spoiled. I remembered reluctantly the full-power trial which had to be made.

"I went to the telephone, called the Air Ministry to hear about the weather. They spoke of everything from ice formation to clouds covering the high ground; but they did say wind was from the north at 75 miles per hour at 17,000 feet.

"This was the end of an afternoon of leisure.

"I went down to the hangars at 2 p.m.; I had the aeroplane pulled out and started, and sent a telegram to Turnhouse asking for petrol. I was just going to leave when I was called back to the Mess—'wanted by the Air Ministry'; the Press Section had noticed the announcement in the Technical Press. When was the full-power trial to be done? This afternoon, they were told, and requested not to ask questions. I wanted to be back by dusk and I promised to ring them up on my return, and flew off to Edinburgh.

"I have read much about the return journey; but nothing about the journey up, which was much more hazardous. As the wind was much stronger than I expected I arrived at Turnhouse at 4.15 p.m. instead of 3.45 p.m. I found no petrol waiting, as I had arrived sooner than my telegram; but owing to the efficiency of the Station this very necessary requirement was forthcoming quickly. . . .

"It was now approaching dusk; there were no clouds in Edinburgh and the sky was that dark blue that precedes the dusk. There was a northerly gale blowing and I decided that I would fly back, as I felt it would be impossible to miss London in the dark. Taking off at 5.5 p.m., and climbing at 200 m.p.h., I noticed with some pleasure that I had no drift, and at 5,000 feet that I had a considerable sensation of speed. This meant a good wind and less chance of running out of petrol in the dark near London in the event of a miscalculation.

"The ground then disappeared and soon I was at my height with only my instruments, and a rapidly tiring left leg. My air speed varied between 305 and 325. The engine revolutions were constant at 2,975, and boost constant at 5½ lb. There were ten minutes of high cloud to go through, when the cabin frosted up, and a hoar-frost formed on the wings.

"Sometimes I felt sorry that I was doing this, and thought of the comfort of my men at Northolt; at other times I felt glad. After forty minutes I decided to descend. The air speed now was 400; the revolutions 3,600; the ground speed was probably 550. I had an odd feeling flying through a cloud at night at a speed I knew to be in excess of 500 miles per hour. Coming out of a cloud at 5,000 feet, I saw momentarily a red light flashing the letter of my station. But by the time I had registered this I was seven miles farther on.

"The signal time from the take-off to going over Northolt was 43 minutes; the time on my own watch 44 minutes.

"I returned to Northolt about five minutes later and landed."

Our old friend the Q.E.D. which kept everyone on tenterhooks at Mildenhall in 1934. The engine is a Pratt and Whitney Hornet. This machine was flown in the Bendix event by George Armistead. On the right is Max Constant's special Beechcraft.

SPEED in the STATES

Pedigree "Racing Ships" Compete for Bendix Trophy.

IT is felt that the sport-starved flying fraternity of Great Britain may derive some entertainment from the following account of the Bendix Trophy race, as submitted by an American correspondent. This is America's major annual race and is rivalled in importance only by the Thompson Trophy event, won this year by Roscoe Turner in his Laird (Twin Wasp) which has a fixed undercarriage *à la* Gladiator. Turner averaged 283.42 m.p.h. "round the sticks." Second in the Thompson event was Earl Ortman in a Marcoux-Bromberg (née Keith Rider) with a Twin Wasp Junior engine. This machine has a part in the currently released film *Test Pilot*. Incidentally, the Seversky "flown" by Clark Gable in that film resembles those used in the Bendix Race by Jacqueline Cochran and Frank Fuller. Our correspondent writes:—

There were ten starters in the Bendix Trophy—the eighth annual event of the series. Though California boasts of everlasting sunshine it was rather cold at midnight when the heavily loaded racers took to the air. Thousands of spectators gave up a good night's sleep to crowd Dudley Steele's Union Air Terminal at Burbank. The reason for the early start was that the racing planes would be able to reach Cleveland early in the afternoon, where another large crowd was enthusiastically watching the National Air Races.

This was the line-up: Jacqueline Cochran in a modified Seversky P-35 pursuit; Frank Fuller in an earlier model of Miss Cochran's ship; Max Constant in a Wasp Junior Beechcraft; Frank Cordova in a tri-engined Bellanca; George Armistead in a Hornet-powered "Q.E.D." racer; John Hinchey and Charles La Jotte in a Spartan Executive; Lee Gehlbach in a Wasp-powered Wedell-Williams racer; Robert Perlick in a Cyclone-powered Beechcraft; Paul Mantz in a 750 h.p. Lockheed Orion; Ross Hadley in a Beechcraft (Wasp Junior).

E. C. Hall in a Lockheed "12" and Bernarr MacFadden in a Northrop Gamma withdrew.

Historical

A brief history of the ships may be interesting. Four were either Jacqueline Cochran's or had been made famous by her, and a fifth one of hers might have been there had it not burned while being turned over to Mexico for battle service in the almost forgotten Spanish War. One plane, in which "Jacky" made her debut among the famous, was the large Northrop Gamma sold to 70-year-old Bernarr MacFadden, the publisher. The plane was first built with a V-12 Curtiss Conqueror engine up forward, and was all set to take the MacRobertson Race in its stride when Miss Cochran crashed it at the end of a transcontinental flight. Later it was rebuilt with a Twin-Row Wasp, and it made many a strenuous flight, most memorable among which were Howard Hughes' speedy dashes across the continent. Miss Cochran also had some ground looping and other accomplishments performed in the airplane at various intervals, which aged it considerably. When it was sold to MacFadden for the Bendix dash the final touches were added to its illustrious career, as the pilot, closely paralleling an incident a few minutes previously, involving a Navy Fairchild, landed the big job in a cross wind, wiping out the landing gear. Thus was the Northrop a non-starter. It had a good chance of winning the Bendix, too, for it had a good top speed, plenty of sub-stratosphere experience, and enough fuel for a non-stop flight from Los Angeles to New York in an elapsed time of about 9 hours.

Paul Mantz's Lockheed Orion (top) is one of the few with a metal fuselage. Below it is a Wasp Junior-powered Spartan Executive flown by Charles La Jotte. There is an auxiliary tank behind the cabin.

Another of Miss Cochran's former airplanes was the "Q.E.D." sold to George Armistead, who had had a little experience at long-distance racing. The plane was first made public in England, where it took off in quest of some of the MacRobertson prize-money. It got no farther than Roumania, where it went on exhibition for the government and established a new speed record for the country under the guidance of Miss Cochran and Lowell Smith. Miss Cochran spent many a nickel in 'phone calls trying to get hold of the "Q.E.D." for the London-Melbourne Race after her Northrop had crashed, and was just able to get it over in time for competition. The late Lee Miles flew the big "Q.E.D." in the 1936 Thompson, but had to withdraw on the last lap because of engine trouble, and later landed it in a parking lot when trouble was encountered with the controllable-pitch prop. George Armistead had the plane reconditioned at the Timm Aircraft Corp., and appeared to be one of the chief contenders in the Bendix. However, he got no farther than Arizona, when it is reported that engine trouble got the better of him and he was forced to withdraw from the race. So the old "Q.E.D." has yet to win its first purse.

Miss Cochran's Beechcraft, which flew in the 1937 Bendix with untold success, was entered this year in the name of Max Constant, and Miss Cochran flew a brand-new Seversky. This latter ship was flown east-west by Col. Seversky against head winds to set a new speed record of 10 hours for the crossing. "Jacky" already had some experience flying Seversky when she piloted the original forerunner of the Seversky pursuit to a new women's speed record at Miami, Fla. This new Seversky of hers is not much different from the standard U.S. Army pursuit, and therefore was an almost exact duplicate of Frank Fuller's entry. The most noticeable change in outside

The Cyclone-engined Northrop Gamma of Bernarr MacFadden. This machine, with Conqueror engine, was entered for the MacRobertson Race but came to grief.

The Seversky single-seater—the type which flew into first and second places. It is similar to a new standard pursuit machine of the U.S. Army Air Corps.

appearance was that the landing gear fairings were larger and completely housed the wheels when retracted. Miss Cochran also had more fuel on board than Fuller. Some of the interesting features on the Seversky are that the fixed tail surfaces are all flush-riveted and the leading edges are sharp-pointed, and not blunt as is usually the custom.

Miss Cochran, as she is known to the public, is the wife of Mr. Odlum, millionaire officer of the Atlas Corporation, and is thus able to afford the best in airplanes; she rivals Howard Hughes in the number of speed planes owned.

Another interesting plane in the race was Frank Cordova's three-engined Bellanca, which had been built for Alexis Papana. The plane had been designed for a 5,000-mile cruising range, but on testing the engines were found to have a higher fuel consumption than contemplated and the ship fell a few hundred miles short of the mark. Since the Menasco company had, at the time, gone into liquidation, Bellanca was "holding the bag" with two gullible Menascos in its ship and one Ranger engine in between the two in the nose of the fuselage. Incidentally, the Menasco company has since been reformed and its engines are now finding a very favourable reception by the industry. Since Papana did not want the plane with less than a 5,000-mile range, Frank Cordova took the ship and tuned her for the Bendix grind. The two Menascos were of the six-cylinder inverted in-line type of 260 h.p. each for take-off and the Ranger was an inverted vee type with 450 h.p. With this arrangement the plane had a very small frontal area, and thus its speed was surprising.

Cordova was the last to take off in the race, and took up a good part of the runway in getting up into the air with his heavy load. Once in the air his average speed went up to 318 m.p.h., but as he was reaching Cleveland one of his engines went dead. He could have gone on to a place in the money, but he did not wish to strain his remaining two motors and landed a few hundred miles from Cleveland.

A Special Beechcraft

The Timm Aircraft Corporation rebuilt Robert Perlick's Beechcraft just in time for the race. Last year it was wrecked taking off in the Bendix, when the heavy load in the ship caused one of the tyres to rip off when the ship began to sway on the runway. This year, with the same load, Bob Perlick gave the ship the gun and got into the air without much trouble. The plane, originally designed for an engine somewhere in the neighbourhood of 550 h.p., had all of 800 h.p. in the nose and proved itself a very speedy airplane. It was necessary for him to circle the airport twice before reaching enough altitude to span the neighbouring mountains. This Beechcraft was one of the first, if not the first, ever built, and had a fixed landing gear. The cabin was so loaded with fuel tanks that its pilot had to climb through a small window up forward to get inside.

Most other ships in the race were more of the order of sport-planes than racers.

The fact that same planes were not able to enter the Thompson and Bendix Races was the reason for the scarcity of the true racing ships in the Bendix. They were all in Cleveland to take part in the closed course events, where more money was offered. This left the stock-model airplane a chance to prove itself. However, there *was* one ship, a real veteran at the game, entered by Lee Gehlbach, that would have been more suited for closed-course racing. However, it was fitted up with enough gas for the dash and with such a daring pilot as Gehlbach at the controls it had possibilities. It was the old Wedell-Williams "92," which has placed in more racing events than any other airplane in the world to-day. Cracked up by Jack Wright in 1937, it was rebuilt for this year's races. It is powered with a 450 h.p. Pratt and Whitney Wasp engine and is of the usual Wedell-Williams low-wing, wire-braced design.

And that was the line-up as the gun was fired for the take-off. The ships went up at approximately half-hour intervals, and the one with the least elapsed time for the trip to Cleveland would win the Bendix trophy and a prize of $9,000 for the 2,043-mile dash, with an additional $2,500 for the woman making the fastest elapsed time.

Another $1,000 was offered for the one who proceeded on to Bendix, New Jersey, in the fastest time, and another $5,000 offered to the participant breaking the Bendix record of 9 hours and 35 minutes. A total purse of $30,000 spurred the fliers on.

Winner's 249 m.p.h.

A good portion of the money, however, was eventually gobbled up by pretty Jacqueline Cochran, the only woman in the race. She not only placed first in the dash to Cleveland, beating her ten male competitors, but also went on to Bendix to capture the fastest elapsed time for the transcontinental crossing. Frank Fuller was a close second and also went on to Bendix, New Jersey. Fuller, noted paint manufacturer, had to make a stop to refuel at Wichita, while "Jacky" made the hop to Cleveland non-stop, and thus accounted for the shorter elapsed time.

The weather was very bad along the route, which accounted for three of the ships not reaching the finish line and also for there being no new Bendix speed record. Miss Cochran's average speed for the crossing, though, was 249 m.p.h., compared with the 258 m.p.h. mark set by Fuller last year. $11,000 went to Miss Cochran, $5,000 to Fuller for second place with a speed of 238.6 m.p.h., $3,000 to Paul Mantz for third at 206.5 m.p.h., $2,000 for fourth to Max Constant at 199.3 m.p.h., $1,000 for fifth to Hadley at about 185 m.p.h., and the other finishers were out of the money. R. C. M.

Forthcoming Events

October 8. Opening of new Cambridge Aerodrome by Secretary of State for Air.

October 14. Northamptonshire Aero Club Annual Ball, Salon de Danse, Northampton.

October 15. South Coast Flying Club: Annual Dinner and Dance, Grand Hotel, Brighton.

October 20. R.Ae.S. Lecture*: "Light Alloys in Aircraft Construction," by M. le Coeuvre.

November 3. R.Ae.S. Lecture*: "The Meteorological Problem of the North Atlantic," by Capt. F. Entwistle, B.Sc.

November 9 (Wednesday). R.Ae.S. Lecture*: "American Aircraft," by T. P. Wright, F.I.Ae.S., F.R.Ae.S.

November 17. R.Ae.S. Lecture*: "The Work of the D.V.L.," by Dr. F. Seewald.

November 18. Brooklands Four-club Annual Dinner and Dance, Grosvenor House, London.

November 18 - December 4. Paris Aero Show, with Air Transport Congress.

December 1. R.Ae.S. Lecture*: "Flying Controls," by Prof. G. T. R. Hill, M.C., M.Sc., F.R.Ae.S.

December 15. R.Ae.S. Lecture*: "Some Results from the Deutsche Forschungsanstalt für Segelflug Smoke Tunnel," by Herr A. Lippisch, A.F.R.Ae.S.

* All these Lectures take place at 6.30 p.m., at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1.

THE INDUSTRY

Trade Notes and News : Equipment at the Building Exhibition

Folland Aircraft Goes Ahead

THE report of Folland Aircraft (formerly British Marine Aircraft) for the year ended June 30 shows a welcome change of fortune, a net loss of £37,327 experienced by the old organisation during the previous year having given place to a net profit of £16,482.

In the interim the policy of the new board and management has had its effect, while a useful amount of sub-contract work has been obtained. Since the last general meeting, it is stated, there has been a 261 per cent. increase in orders in hand, while labour employed has increased by 78 per cent.

Under the reconstruction scheme, which involved a reduction in the paid-up capital from £500,000 to £300,000, certain lost and intangible assets were written off or heavily written down, and by utilising £6,999 of the current profit the board is able to complete the process of dealing with the Sikorsky licences, which now stand in the books at £1. Against current liabilities of only £17,177, floating assets appear for £128,151, of which £50,225 is cash.

Flexible Mountings

IT may be recalled that in *Flight* a year ago, and subsequently in the issue of January 13 this year, we described a new principle, evolved by Metalastik, Ltd., of Evington Valley Road, Leicester, for the production of rubber-bonded-to-metal items, such as engine and instrument mountings.

After a lengthy period of experimental work the firm is now in production with these mountings, and also with several other items of interest to aircraft constructors. Among them is a flexible airscrew coupling of elliptical construction. The whole of the rubber in the design is utilised; when torsional stresses are applied and the inner ellipse attempts to rotate within its outer member, half the rubber comes under compression while the remaining part is in tension.

Again, ball races with the outer housing rubbered should find a number of uses, e.g., in conjunction with push-pull controls, where trouble might otherwise be experienced due to vibration and deflection.

A feature of the Metalastik principle which holds good no matter what the application, is that the rubber remains in complete repose until the load is applied, thus leaving the whole of its characteristics available for useful duty. The joining of metal and rubber in each case is so complete that under test the rubber would tear rather than the joint come apart.

One other interesting application seen during a visit to the Metalastik works was the "Wireflex" seat cushion, in which steel wire mesh, rubber-bonded, is folded in such a manner that the convolutions support one another and give a highly efficient springing effect. The seats are remarkably light, and should have an appeal for aircraft furnishing.

Small Tools

USEFUL both as a catalogue and as an engineer's reference book, the well-bound 238-page E.S.C. Small Tools Catalogue has just appeared in a new edition, S.T.O. 20/2. Executives may obtain copies from the English Steel Corporation, Sheffield.

Palmer Accessories

LIGHT rubber matting for foot-treads and aircraft flooring; rudder bar toe-straps; brake-block de-greasing and washing fluid; and hydraulic brake and gun-gear controls; these are the subjects dealt with in the latest loose-leaf inserts for inclusion in the Palmer catalogue (The Palmer Tyre, Ltd., Thames House, Millbank, London, S.W.1).

Comprehensive Production Facilities

SEVERAL well-known aircraft constructors are customers of British Mechanical Productions, Ltd., 79a, Rochester Row, London, S.W.1, who have a factory particularly well equipped for various types of repetition and other work. An associated company, the Pitter Gauge and Precision Tool Co., Ltd., specialise in the type of product which their name implies.

The British Mechanical Productions organisation consists of an automatic screw-turning department and second-operations shop, with full A.I.D. inspection facilities; tool-room for producing jigs, tools and fittings other than those instruments turned out by the Pitter Gauge Co. (plastic moulding tools are a speciality); a moulding shop; power press department; a shop producing turned and threaded insulators of all kinds in various insulating materials; wire-bending section (split pins, etc.) and radio and electrical components departments.

Among the items turned out by the last-named section are radio accessories under a trade name known to all radio experimenters—"Clix."

The directors are Brig. Gen. R. F. Legge, C.B.E., D.S.O. (chairman), and Messrs. C. R. Cook (managing), H. A. Lingard, and L. Newton Davey (sales).

Some of the "Metalastik" rubber-bonded-to-metal specialities mentioned in a news item above: a rubber-mounted ball-race; components of a radial engine mounting; various sizes of instrument mountings; a flexible airscrew coupling; and an aircraft radiator mounting

The Industry

AIRCRAFT FACTORY EQUIPMENT at the BUILDING EXHIBITION

A DAY could be profitably spent by the sales and plant staff of aircraft manufacturers at the Building Exhibition which is open at Olympia, London, until October 1.

In the range of subjects of interest to the aircraft industry there are aerodrome and airport building constructional work, and factory equipment of all types down to drawing office supplies. There are direct references to aviation requirements and there is hardly a stand which does not yield information that the firm has only recently supplied to some aircraft firm at least one of their range of products.

For administration buildings, ornamental bricks are shown by the Maston Valley Brick Co. and the London Brick Co. Naturally these two firms also show a wide range of bricks for factory buildings.

Equipment for the offices is very fully demonstrated and a large range of steel office furniture is shown by Steeletta. There is a very complete stand of drawing office equipment, ranging from instruments to blue print apparatus, by Norton and Gregory Ltd., who are showing their new Ferazo and Dazo system.

Suitable units for the lighting, heating and ventilating of factories are in view in the Show. Types of lamps and shades for industrial use are exhibited by Simplex Electric Light Co., Ltd.

A wide range of individual heating and ventilating units are shown by Copperad and Utilities (London), Ltd.

Roof ventilators and roof sheeting is shown by Cellactite, and steelwork by H. Young and Co., The British Steel Works Association and Thos. Piggott, Ltd., whose Lamella construction is already well known.

Concrete, plain and reinforced, for factory use, is shown by the Cement and Concrete Association. Models and photographs illustrate their application. Sliding doors and conveyors are represented on the stand of George W. King, who has installed conveyors at Speke and most of the other shadow factories.

One of the noticeable features is the attention devoted to A.R.P. shelters, for both domestic and factory uses. A large number of suitable doors are shown by H. Young and Co. and manhole covers by the Dover Engineering Co. Both firms demonstrate full-size models of air raid shelters using their particular products. On the stand of the British Steel Manufacturers Association is a series of sectional models of A.R.P. shelters for large numbers of people.

Since there was no machinery exhibition this year manufacturers of woodworking equipment have utilised the Building Exhibition to show their latest developments. J. Sagar and Co. have an extensive range of representative machinery, some of which has recently been installed in aircraft factories. E. R. Cole show grinding machines, saws and buffs. E. P. Barrus, Ltd., demonstrate the Carter Wasp plane and other woodworking machinery which they have recently supplied to Airspeed, Parnall and to other aircraft manufacturers. Thos. White, of Paisley, have very large woodworking machines for a variety of duties.

Schubert show special woodworking machinery, including glue-spreading and steam-heating equipment. Karcher also show new woodworking machinery, including a four-spindle auto-lathe. Danckaert exhibit a series of high-speed woodworking machines.

Robinson, of Rochdale, show special woodworking machines, including a planer which sucks the chips downwards from the tool. Wadkin exhibit more woodworking machinery, including some very high-speed routers. The Midland Saw and Tool Co., Ltd., show some high-speed saws and a chain and hollow chisel mortiser. Small tools of all descriptions for wood and metal work are on the stand of Tyzack, while tube-bending machines are shown by Hilmore, Ltd., and Kennedy Bros.

Ventilating Equipment

Dope room equipment is covered from the heating and ventilating point of view by Copperad Utilities (London), Ltd. Copperad have recently supplied their units to large R.A.F. stations, one of which alone employs 300 units. Various forms of portable spraying equipment are shown and the following firms have recently supplied equipment to various aircraft factories as well as to the R.A.F. and other air forces: Lacy-Hulbert, Kurt Erlach, Ltd. (Velospray equipment) and Aerostyle, Ltd.

Scaffolding for use in fuselage assembly shops is shown by Mills Scaffolds, who also make air raid shelters

Firms showing approved aircraft tools include the Union Glue and Gelatine Co. and Central Chemicals, Ltd. The first-named has a comprehensive display of abrasive materials, ranging from sand to grinding wheels, together with casein glues approved at the Air Ministry, and dry cement with a shear strength of 2,000 lb./sq. in. Central Chemicals, Ltd., show examples of wood glued by Curtus glue, as used by Airscrews, Ltd.

Electric clocks for offices and works are exhibited by Smith's Instruments, Ltd. Gillett and Johnson, Ltd., also show various types of clocks, of which the largest is the clock for the airport at Birmingham.

Survey Company's Development

ACCORDING to a statement recently issued, the directors of H. Hemming and Partners, Ltd., have decided to put the company into voluntary liquidation as the main purpose of its original formation has been achieved.

The company has brought into one group the Aircraft Operating Co., the Aircraft Operating Co. of Africa (Pty.), Ltd., and Aerofilms, Ltd. These three organisations, together with itself, are recognised by the Government, and the group's activities in air survey in the British Empire and abroad are regularly reported in the annual *Report on the Progress of Civil Aviation*.

Steps are now being taken towards further consolidation. H. Hemming and Partners was originally formed by Major H. Hemming and Mr. James Horsfall. The company carried out an extensive air survey of the goldfields in Western Australia as well as extensive air survey and reconnaissance work in New Guinea.

Wing Cdr. F. C. V. Laws was the leader of the company's air survey expedition, and, after his return to England, joined the board.

Mr. Horsfall, who took a leading part in bringing the companies together, is retiring from the boards in order to concentrate the application of air survey to economic development.

About Batteries

THE numerous advantages of Nife nickel-cadmium alkaline batteries are set out in detail in a new and attractively illustrated catalogue issued by Nife Batteries, Ltd., Hunt End Works, Redditch, Worcestershire. These batteries are used in the Short Empire flying boats.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

BARKINGSIDE SYNDICATE, LTD.—Private company, registered September 15. Capital, £100 in 100 shares of £1 each. Objects: To carry on business as engineering experts and consultants, manufacturers of and dealers in engines and propelling machinery of all kinds, including marine and aeronautical machines. The first directors are: Benjamin Shore (director of Interota, Ltd.), Sidney D. Lancaster (director of Hunter & English, Ltd., and Interota, Ltd.). Registered office: Fairlop Works, Barkingside, Ilford, Essex.

PETERBOROUGH FLYING CLUB, LTD.—Private company, registered September 17. Capital, £100 in 100 shares of £1 each. Objects: To establish and maintain in Peterborough and elsewhere, institutions for instruction in aeronautics, etc. The directors are: Bernard J. W. Brady and John P. A. Fulton (directors of Aircraft Exchange and Mart, Ltd.). Registered office: 7, Park Lane, London, W.1.

AIR MAZE (GREAT BRITAIN) LTD.—Private company, registered September 21. Capital, £100 in 100 shares of £1 each. Objects: To carry on the business of manufacturers of air filters to be used in conjunction with internal combustion engines, air compressors, air intake or exhaust silencers, etc. The first directors are: Robt. B. Howells and Ernest Smart. Registered office: Bush House, Aldwych, London, W.C.2.

PETERBOROUGH AIRCRAFT COMPANY, LTD.—Private company, registered September 16. Capital, £100 in 100 shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in aeroplanes, seaplanes and other aircraft, etc. The first directors are: Bernard J. W. Brady and John P. A. Fulton (directors of Aircraft Exchange and Mart, Ltd.). Registered office: 7, Park Lane, London, W.1.

AERONAUTICAL PATENT SPECIFICATIONS

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

(*Published September* 29, 1938.)

6151. NUTSFORD, A.: Counting mechanism for air logs (491,559).

6245. INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD., WIGG, D., and TARRIS, F. J.: Control mechanisms for aircraft and other vehicles (491,505).

6714. WESTLAND AIRCRAFT, LTD., and WIDGERY, W. M.: Aircraft (491,588).

13840. PHILLIPS AND POWIS AIRCRAFT, LTD., and EMERY, G. A. ST.-C.: Aircraft controls (491,549).

14901. SPERRY GYROSCOPE CO., INC.: Positional control means, particularly for use in the steering of dirigible craft (491,400).

27350. DEWANDRE, A.: Gun mounting with shock-absorber (491,353).